Route 349 NB and SB over Amtrak Railroad

State Project Number 58-332

Groton, Connecticut

List of 90% Special Provisions

NOTICE TO CONTRACTOR – AMTRAK SPECIFICATIONS [NOT INCLUDED… *CONNDOT/AMTRAK TO DEVELOP*]

SECTION 0.058 - NOTICE TO CONTRACTOR - TRAFFIC DRUMS AND TRAFFIC CONES

SECTION 0.060 - NOTICE TO CONTRACTOR - NCHRP 350 REQ. FOR WORK ZONE TRAFFIC CONTROL DEVICES

SECTION 1.06.01 – CONTROL OF MATERIALS

SECTION 1.06.07 – CONTROL OF MATERIALS

SECTION 1.07 - LEGAL RELATIONS AND RESPONSIBLITIES

SECTION 1.08 - PROSECUTION AND PROGRESS

SECTION 10.00 - GENERAL CLAUSES FOR HIGHWAY ILLUMINATION AND TRAFFIC SIGNAL PROJECTS

0216004A – PERVIOUS STRUCTURE BACKFILL — s.p. not needed if Jan16 supps used

0406275A – FINE MILLING OF BITUMINOUS CONCRETE (0 TO 4 INCHES) — This is correct; the estimate has HMA

0406287A – RUMBLE STRIPS-AUTOMATED

0406289A – REMOVAL OF RUMBLE STRIPS

0503151A - REMOVAL OF SUPERSTRUCTURE (SITE NO. 1)

0503152A - REMOVAL OF SUPERSTRUCTURE (SITE NO. 2)

0504009A – RAILROAD PROTECTION — Not on estimate; s.p. not needed if Jan16 supps used

0521021A – STEEL-LAMINATED ELASTOMERIC BEARINGS

0601032A – ROADWAY PARAPET WALL

0601097A – VARIABLE DEPTH PATCH

0602936A – DRILLING AND GROUTING REINFORCING BARS

0610954A – EPOXY INJECTION CRACK REPAIR

0707009A – MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)

0714050A – TEMPORARY EARTH RETAINING SYSTEM — s.p.'s not needed if Jan16 supps used

0715050A – EARTH RETAINING SYSTEM LEFT IN PLACE

0822005A – TEMPORARY PRECAST CONCRETE BARRIER CURB (STRUCTURE)

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0822006A – RELOCATED TEMPORARY PRECAST CONCRETE BARRIER CURB (STRUCTURE)

0904949A - METAL BRIDGE RAIL (SOLID PANEL) (8' HIGH)

0904902A – TEMPORARY PROTECTIVE FENCE (BRIDGE)

0969062A – CONSTRUCTION FIELD OFFICE, MEDIUM

0970006A – TRAFFICPERSON (MUNICIPAL POLICE OFFICER)

0970007A – TRAFFICPERSON (UNIFORMED FLAGGER)

s.p. not needed if Jan16 supps used

0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

0974001A – REMOVAL OF EXISTING MASONRY

0979003A – CONSTRUCTION BARRICADE TYPE III

s.p. not needed if Jan16 supps used

1003906A – REMOVE LIGHT STANDARD

1003912A – REMOVE CONCRETE LIGHT STANDARD BASE

1003916A – REMOVE AND RELOCATE LIGHT STANDARD

1010025A – CONCRETE HANDHOLE EXTENSION – TYPE 1

1010901A – REMOVE AND RELOCATE CONCRETE HANDHOLE

1014901A – REMOVE CABLE

1015034A – GROUNDING AND BONDING

1019027A – PRE-ASSEMBLED AERIAL CABLE

1020030A - TEMPORARY ILLUMINATION UNIT

1210101A – 4" WHITE EPOXY RESIN PAVEMENT MARKINGS

1210102A – 4" YELLOW EPOXY RESIN PAVEMENT MARKINGS

1210103A – 6" WHITE EPOXY RESIN PAVEMENT MARKINGS

1210105A – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS

These items not on DES-1 or -2

1216020A – 6" BLACK AGGREGATE COVER-UP RESIN PAVEMENT MARKINGS

1216021A – 8" BLACK AGGREGATE COVER-UP RESIN PAVEMENT MARKINGS

1216024A – BLACK AGGREGATE COVER-UP RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS

Rev. Date 04/19/05

NOTICE TO CONTRACTOR - TRAFFIC DRUMS AND TRAFFIC CONES

Traffic Drums and 42-inch (1 m) Traffic Cones shall have four six-inch (150 mm) wide stripes (two - white and two - orange) of flexible bright fluorescent sheeting.

The material for the stripes shall be one of the following, or approved equal:

- 3M Scotchlite Diamond Grade Flexible Work Zone Sheeting, Model 3910 for the white stripes and Model 3914 for the orange stripes,

- Avery Dennison WR-7100 Series Reboundable Prismatic Sheeting, Model WR-7100 for the white stripes and Model WR-7114 for the orange stripes.

Rev. Date 05/05/14

NOTICE TO CONTRACTOR - NCHRP 350 REQ. FOR WORK ZONE TRAFFIC CONTROL DEVICES

CATEGORY 1 DEVICES (traffic cones, traffic drums, tubular markers, flexible delineator posts)

Prior to using the Category 1 Devices on the project, the Contractor shall submit to the Engineer a copy of the manufacturer's self-certification that the devices conform to the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH), as appropriate.

CATEGORY 2 DEVICES (construction barricades, construction signs and portable sign supports)

Prior to using Category 2 Devices on the project, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices (both sign and portable support tested together) have been crash tested and have approval in writing from FHWA conforming to the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH), as appropriate.

Specific requirements for these devices are included in the Special Provisions.

Information regarding NCHRP Report 350 and AASHTO Manual for Assessing Safety Hardware (MASH) may be found at the following web sites:

FHWA: http://safety.fhwa.dot.gov/roadway_dept/Policy_guide/road_hardware/

ATSSA: http://www.atssa.com/resources.aspx

NOTE: The portable wooden sign supports that have been traditionally used by most contractors in the State of Connecticut do NOT meet NCHRP Report 350 criteria and shall not be utilized on any project advertised after October 01, 2000.

CATEGORY 3 DEVICES (Truck-Mounted Attenuators & Work Zone Crash Cushions)

Prior to using Category 3 Devices on the project, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices have been crash tested and have approval in writing from FHWA conforming to the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH), as appropriate.

SECTION 1.06 - CONTROL OF MATERIALS

Article 1.06.01 - Source of Supply and Quality:

Add the following:

For the following items the Contractor shall submit a complete description of the item, together with eight (8) copies of shop drawings, cuts and other descriptive literature which completely illustrates such items presented for formal approval. Such approval shall not change the requirements for a certified test report and materials certificate as may be called for.

Light Standards
Conductors
Luminaires
Conduit
Fuses and Fuse Holders
Precast Foundation
Service Items
Temporary Illumination Unit
Aerial Cable
Handhole
Junction Box

Required catalog cuts for all items listed above shall be submitted in one package at the same time. All approvals or disapprovals and comments will be returned in one package.

When required by the contract documents or when ordered by the Engineer, the Contractor shall prepare and submit (8) sets of catalog cuts and/or shop drawings for all illumination items in one package at the same time to the following for approval prior to ordering or fabrication.

Mr. Gregory Dorosh
Principal Engineer – Facilities Design
Bureau of Engineering and Construction
Connecticut Department of Transportation
P.O. Box 317546
Newington, Connecticut 06131-7546

SECTION 1.06 - CONTROL OF MATERIALS

Article 1.06.07 Certified Test Reports and Materials Certificate

1) For the materials in the following items, a certified Test Report will be required confirming their conformance to the requirements set forth in these plans or specifications or both. Should the consignee noted on a Certified Test Report be other than the Prime Contractor, then Materials Certificates shall be required to identify the shipment.

Light Standards
Conductors
Anchor Bolts
Aerial Cable
Temporary Illumination Unit

2) For the materials in the following items, a Materials Certificate will be required confirming their conformance to the requirements set forth in these plans or specifications or both.

Light Standards
Conductors
Luminaires
Conduit
Anchor Bolts
Aerial Cable
Temporary Illumination Unit

SECTION 1.07 - LEGAL RELATIONS AND RESPONSIBILITIES

Article 1.07.13 - Contractor's Responsibility for Adjacent Property, Facilities and Services is supplemented as follows:

The following company and representative shall be contacted by the Contractor to coordinate the protection of their utilities on this project 30 days prior to the start of any work on this project involving their utilities:

Mr. Richard Russo
District 2 Electrical Supervisor
Department of Transportation
Colchester, Connecticut
(860) 848-0008

Norwich?

Mr.
Groton Department of Public Utilities

, CT 06
(860)

Mr.
Northeast Utilities

, CT 06
(860)

The following Department representative shall be contacted by the Contractor to coordinate an inspection of the service entrance into the controller/flasher cabinet for controllers within the State right-of-way, when ready for inspection, release, and connection of electrical service. The local Building Department shall be contacted for electrical service inspections for controllers located on Town roads located within the respective municipality.

Mr. Michael LeBlanc
Property & Facilities
Department of Transportation
Newington, CT 06111
860-594-2238
Cell 860-983-5114

Please provide the electrical service request number provided by the power company. This is a Work Request (WR) Number provided by Northeast Utilities (CL&P) or a Work Order Number provided by United Illuminating (UI). For State-owned traffic signals in CL&P territory, contact the Department's Traffic Electrical Unit to obtain the WR Number. For State-owned traffic signals in UI territory, contact the Department's Traffic Electrical Unit to obtain a Request for Metered Service to provide to UI to obtain the Work Order Number. The street address is required for release to local power companies (Groton Utilities or Wallingford Electric).

SECTION 1.08 - PROSECUTION AND PROGRESS

Article 1.08.04 - Limitation of Operations - Add the following:

In order to provide for traffic operations as outlined in the Special Provision "Maintenance and Protection of Traffic," the Contractor will not be permitted to perform any work which will interfere with the described traffic operations on all project roadways as follows:

Lane Closure Information
The Contractor will maintain one lane of traffic on Route 349 in each direction at all times.

Ramps and Turning Roadways (Bridge Nos. 03330 and 03331)
The Contractor will not be allowed to perform any work that will interfere with existing traffic operations on:

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 3:00 p.m. and 7:00 p.m.
Saturday and Sunday between 10:00 a.m. and 9:00 p.m.

During construction work on Bridge No. 03330 (southbound off-ramp) and Bridge No. 03331 (northbound on-ramp), existing traffic operations will be considered to be as shown on the Highway plans contained in the project contract.

When necessary for construction operation purposes and with prior approval from the Engineer, the Contractor will be allowed to halt ramp and turning roadway traffic for a period not to exceed 10 minutes to perform necessary work between 12:00 a.m. and 5:00 a.m. on all non-Holiday days.

US Route 1 (Long Hill Rd.), Bridge St., Broad St., North St. Meridian St. and Meridian St. Ext.
The Contractor will not be allowed to perform any work that will interfere with one lane of through traffic in each direction on:

Monday through Friday between 6:00 a.m. and 7:00 p.m.
Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

All Other Roadways
The Contractor will not be allowed to perform any work that will interfere with the existing number of lanes of traffic, including turning lanes, on:

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 3:00 p.m. and 6:00 p.m.
Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

Additional Lane Closure Restrictions
It is anticipated that work on adjacent projects will be ongoing simultaneously with this project. The Contractor shall be aware of those projects and anticipate that coordination will be required to maintain proper traffic flow at all times on all project roadways, in a manner consistent with these specifications and acceptable to the Engineer.

The Contractor will not be allowed to perform any work that will interfere with traffic operations on a roadway when traffic operations are being restricted on that same roadway, unless there is at least a one mile clear area length where the entire roadway is open to traffic or the closures have been coordinated and are acceptable to the Engineer. The one mile clear area length shall be measured from the end of the first work area to the beginning of the signing pattern for the next work area.

The Contractor will not be allowed to perform any work over an active travel path. During the course of active construction work, the Contractor shall close the lane or lanes directly below the work area for the entire length of time that the overhead work is being undertaken.

SECTION 10.00 - GENERAL CLAUSES FOR HIGHWAY ILLUMINATION AND TRAFFIC SIGNAL PROJECTS

Article 10.00.10 Section 3. Functional Inspection, first paragraph after the 2nd sentence: Add the following:

The contractor shall have a bucket truck with crew on site during the Functional Inspection to make any necessary aerial signal adjustments as directed by the Engineer.

Article 10.00.12 - Negotiations with utility company: Add the following:

The contractor shall give notice to utility companies a minimum of 30 days prior to required work or services to the utility company. Refer to Section 1.07 – Legal Relations and Responsibilities for the list of utility companies and representatives the contractor shall use.

The Contractor shall perform all work in conformance with Rules and Regulations of Public Utility Regulatory Authority (PURA) concerning Traffic Signals attached to Public Service Company Poles. The Contractor is cautioned that there may be energized wires in the vicinity of the specified installations. In addition to ensuring compliance with NESC and OSHA regulations, the Contractor and/or its Sub-Contractors shall coordinate with the appropriate utility company for securing/protecting the site during the installation of traffic signal mast arms, span poles or illumination poles.

When a span is attached to a utility pole, the Contractor shall ensure the anchor is in line with the proposed traffic signal span wire. More than 5 degree deviation will lower the holding strength and is not allowed. The Contractor shall provide any necessary assistance required by the utility company, and ensure the anchor and guy have been installed and properly tensioned prior to attaching the span wire to the utility pole.

02/12/16

ITEM #0216004A – PERVIOUS STRUCTURE BACKFILL

Description: Pervious structure backfill shall include the furnishing, placing, and compaction of pervious material adjacent to structures.

Material: Pervious structure backfill shall conform to the requirements of Article M.02.05.

The materials for bagged stone shall conform to the following requirements:

(a) The crushed stone or gravel shall conform to the grading requirements of Article M.01.01 for No. 3 or No. 4 coarse aggregate or a mixture of both.

Construction Methods: Pervious structure backfill shall be placed adjacent to abutments and elsewhere as called for. It shall be placed above a plane extending on a 2 to 1 slope from the upper edge of the footing to the top of the embankment, or as shown on the plans. Where the face of undisturbed material is above or beneath this slope plane, the amount of pervious structure backfill shall be decreased or increased accordingly, if ordered by the Engineer.

In filling behind abutments or other structures, the fill is placed against undisturbed material, or against compacted embankments having a length in a direction at right angles to the abutment wall not less than twice the height of the structure against which the fill is placed. The slope of the embankment on which the pervious structure backfill is to be placed shall be plowed deeply or cut into steps before and during the placing of pervious structure backfill so both types of material will be thoroughly bonded and compacted.

Each layer of pervious structure backfill shall be spread to a thickness not exceeding 6 inches in depth after compaction and shall be thoroughly compacted as directed by the Engineer by the use of power rollers or other motorized vehicular equipment, by tamping with mechanical rammers or vibrators, or by pneumatic tampers. Any equipment not principally manufactured for compaction purposes and equipment, which is not in proper working order in all respects, shall not be used within the area described above.

Special attention shall be given to compaction in places close to walls where motorized vehicular equipment cannot reach. Within 3 feet of the back face of walls and within a greater distance at angle points of walls, each layer of pervious structure backfill shall be compacted by mechanical rammers, vibrators, or pneumatic tampers.

The dry density of each layer of pervious structure backfill formed from broken or crushed stone, broken or crushed gravel or reclaimed miscellaneous aggregate free of bituminous concrete shall have a dry density after compaction that is no less than 100 percent of the dry density for that material when tested in accordance with AASHTO T180, Method D. If a layer formed from reclaimed miscellaneous aggregate containing bituminous concrete is placed as pervious structure backfill, the wet density of this layer after compaction shall not be less than 100 percent of the wet density of that material when tested in accordance with AASHTO T180, Method D.

In this test, material retained on the ¾ inch sieve shall be replaced with material retained on the number 4 sieve, as noted as an option in the specifications for this test.

Each layer of the pervious structure backfill shall be compacted at optimum moisture content. No Subsequent layer shall be placed until the specified compaction is obtained for the previous layer.

Method of Measurement: Payment lines for pervious structure backfill shall coincide with the limits of the compacted pervious structure backfill as actually placed and ordered by the Engineer.
Basis of Payment: Pervious structure backfill will be paid for the contract unit price per cubic yard for "Pervious Structure Backfill", complete in place.

Pay Item	Pay Unit
Pervious Structure Backfill	C.Y.

ITEM #0406275A - FINE MILLING OF BITUMINOUS CONCRETE (0 TO 4 INCHES)

Description: This work shall consist of the milling, removal, and disposal of existing bituminous concrete pavement.

Construction Methods: The Contractor shall remove the bituminous concrete material using means acceptable to the Engineer. The pavement surface shall be removed to the line, grade, and existing or typical cross-section shown on the plans or as directed by the Engineer.

The bituminous concrete material shall be disposed of offsite by the Contractor at an approved disposal facility unless otherwise stated in the Contract.

Any milled surface, or portion thereof, that is exposed to traffic shall be paved within five (5) calendar days unless otherwise stated in the plans or Contract.

The equipment for milling the pavement surface shall be designed and built for milling bituminous concrete pavements. It shall be self propelled with sufficient power, traction, and stability to maintain depth and slope and shall be capable of removing the existing bituminous concrete pavement.

The milling machine shall be equipped with a built-in automatic grade averaging control system that can control the longitudinal profile and the transverse cross-slope to produce the specified results. The longitudinal controls shall be capable of operating from any longitudinal grade reference, including string line, contact ski (30 feet minimum), non-contact ski (20 feet minimum), or mobile string line (30 feet minimum). The transverse controls shall have an automatic system for controlling cross-slope at a given rate. The Engineer may waive the requirement for automatic grade or slope controls where the situation warrants such action.

The machine shall be able to provide a 0 to 4 inch deep cut in one pass. The rotary drum of the machine shall use carbide or diamond tipped tools spaced not more than $^{5}/_{16}$ inch apart. The forward speed of the milling machine shall be limited to no more than 45 feet/minute. The tools on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture.

The machine shall be equipped with an integral pickup and conveying device to immediately remove material being milled from the surface of the roadway and discharge the millings into a truck, all in one operation. The machine shall also be equipped with a means of effectively limiting the amount of dust escaping from the milling and removal operation.

When milling smaller areas or areas where it is impractical to use the above described equipment, the use of a lesser equipped milling machine may be permitted when approved by the Engineer.

Protection shall be provided around existing catch basin inlets, manholes, utility valve boxes, and any similar structures. Any damage to such structures as a result of the milling operation is the Contractor's responsibility and shall be repaired at the Contractor's expense.

To prevent the infiltration of milled material into the storm drainage system, the Contractor shall take special care to prevent the milled material from falling into the inlet openings or inlet grates. Any milled material that has fallen into inlet openings or inlet grates shall be removed at the Contractor's expense.

Surface Tolerance: The milled surface shall provide a satisfactory riding surface with a uniform textured appearance. The milled surface shall be free from gouges, longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, improper use of equipment, or poor workmanship. The Contractor, under the direction of the Inspector, shall perform random spot-checks with a Contractor supplied ten-foot straightedge to verify surface tolerances at a minimum of five (5) locations per day. The variation of the top of two ridges from the testing edge of the straightedge, between any two ridge contact points, shall not exceed ¼ inch. The variation of the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed ¼ inch. Any unsatisfactory surfaces produced are the responsibility of the Contractor and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

The depth of removal will be verified by taking measurements every 250 feet per each pass of the milling machine, or as directed by the Engineer. These depth measurements shall be used to monitor the average depth of removal.

Where a surface delamination between bituminous concrete layers or a surface delamination of bituminous concrete on Portland cement concrete causes a non-uniform texture to occur, the depth of milling shall be adjusted in small increments to a maximum of +/- ½ inch to eliminate the condition.

When removing bituminous concrete pavement entirely from an underlying Portland cement concrete pavement, all of the bituminous concrete pavement shall be removed leaving a uniform surface of Portland cement concrete, unless otherwise directed by the Engineer.

Any unsatisfactory surfaces produced by the milling operation are the Contractor's responsibility and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

No vertical faces, transverse or longitudinal, shall be left exposed to traffic unless the requirements below are met. This shall include roadway structures (catch basins, manholes, utility valve boxes, etc.). If any vertical face is formed in an area exposed to traffic, a temporary paved transition shall be established according to the requirements shown on the plans. If the milling machine is used to form a temporary transition, the length of the temporary transition shall conform to Special Provision Section 4.06 –Bituminous Concrete, "Transitions for Roadway Surface," the requirements shown on the plans, or as directed by the Engineer. At all

permanent limits of removal, a clean vertical face shall be established by saw cutting prior to paving.
Roadway structures shall not have a vertical face of greater than one (1) inch exposed to traffic as a result of milling. All structures within the roadway that are exposed to traffic and greater than one (1) inch above the milled surface shall receive a transition meeting the following requirements:

For roadways with a posted speed limit of 35 mph or less*:

1. Round structures with a vertical face of greater than 1 inch to 2.5 inches shall be transitioned with a hard rubber tapered protection ring of the appropriate inside diameter designed specifically to protect roadway structures.
2. Round structures with a vertical face greater than 2.5 inches shall receive a transition of bituminous concrete formed at a minimum 24 to 1 (24:1) taper in all directions.
3. All rectangular structures with a vertical face greater than 1 inch shall receive a transition of bituminous concrete formed at a minimum 24 to 1 (24:1) taper in all directions.

*Bituminous concrete tapers at a minimum 24 to 1 (24:1) taper in all directions may be substituted for the protection rings if approved by the Engineer.

For roadways with a posted speed limit of 40, 45 or 50 mph:

1. All structures shall receive a transition of bituminous concrete formed at a minimum 36 to 1 (36:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper shall be 24 to 1 (24:1) in all other directions.

For roadways with a posted speed limit of greater than 50 mph:

1. All structures shall receive a transition of bituminous concrete formed at a minimum 60 to 1 (60:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper shall be 24 to 1 (24:1) in all other directions.

All roadway structure edges and bituminous concrete tapers shall be clearly marked with fluorescent paint. The paint shall be maintained throughout the exposure to traffic.

The milling operation shall proceed in accordance with the requirements of the “Maintenance and Protection of Traffic” and “Prosecution and Progress” specifications, or other Contract requirements. The more stringent specification shall apply.

Prior to opening an area which has been milled to traffic, the pavement shall be thoroughly swept with a sweeper truck. The sweeper truck shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. The sweeper truck shall operate at a forward speed that allows for the maximum pickup of millings from the roadway surface. Other

sweeping equipment may be provided in lieu of the sweeper truck where acceptable by the Engineer.

Any milled area that will not be exposed to live traffic for a minimum of 48 hours prior to paving shall require a vacuum sweeper truck in addition to, or in lieu of, mechanical sweeping. The vacuum sweeper truck shall have sufficient power and capacity to completely remove all millings from the roadway surface including any fine particles within the texture of the milled surface. Vacuum sweeper truck hose attachments shall be used to clean around pavement structures or areas that cannot be reached effectively by the main vacuum. Compressed air may be used in lieu of vacuum attachments if approved by the Engineer.

Method of Measurement: This work will be measured for payment by the number of square yards of area from which the milling of asphalt has been completed and the work accepted. No area deductions will be made for minor unmilled areas such as catch basin inlets, manholes, utility boxes and any similar structures.

Basis of Payment: This work will be paid for at the Contract unit price per square yard for "Fine Milling of Bituminous Concrete (0 to 4 Inches)." This price shall include all equipment, tools, labor, and materials incidental thereto.

No additional payments will be made for multiple passes with the milling machine to remove the bituminous surface.

No separate payments will be made for cleaning the pavement prior to paving; providing protection and doing handwork removal of bituminous concrete around catch basin inlets, manholes, utility valve boxes and any similar structures; repairing surface defects as a result of the Contractors negligence; providing protection to underground utilities from the vibration of the milling operation; removal of any temporary milled or paved transition; removal and disposal of millings; furnishing a sweeper truck and sweeping after milling. The costs for these items shall be included in the Contract unit price.

Pay Item	Pay Unit
Fine Milling of Bituminous Concrete (0 to 4 Inches)	S.Y.

ITEM #0406287A RUMBLE STRIPS - AUTOMATED

Description:
Work under this item shall consist of installing rumble strips on asphalt highway shoulders where shown on the plans or where directed by the Engineer, and in conformance with these specifications.

Construction Methods:
The Contractor shall pre-mark the location of the edge of the cut, and the beginning and ending points of the sections, prior to the installation of the rumble strips. The Engineer shall review and approve the locations.

The Contractor shall arrange for a technical representative, from the company which produces the milling machine to be used on the project, who will be required to be on-site from the beginning of the operation in order to ensure results that meet the requirements of the plans and specifications until such time the Engineer is satisfied.

Rumble strips should not be installed on bridge decks, in acceleration and deceleration lanes, at drainage structures, at loop detector sawcut locations, or in other areas identified by the Engineer.

Automated (Wide Shoulders):
The equipment shall be able to install the rumble strips in sections where the shoulder width from the edge line to an obstruction is greater than or equal to 4 feet. Where there are no obstructions, the equipment shall be used in sections where the shoulder width from the edge line is a minimum of 3 feet. The equipment shall consist of a rotary type cutting head with a maximum outside diameter of 24" and shall be a minimum of 16" long. The cutting head(s) shall have the cutting tips arranged in such a pattern as to provide a relatively smooth cut (approximately 1/16 of an inch between peaks and valleys) in one pass. The cutting head shall be on its own independent suspension from that of the power unit to allow the tool to self align with the slope of the shoulder or any irregularities in the shoulder surface. The equipment shall include suitable provisions for the application of water to prevent dusting. The Contractor shall use a machine capable of creating the finished pattern at a minimum output of 60 rumble strips per minute.

Manual (Narrow Shoulders):
The equipment shall be able to install the rumble strips in sections where the shoulder width from the edge line to an obstruction is between 3 feet and 4 feet. The cutting head(s) shall have the cutting tips arranged in such a pattern as to provide a relatively smooth cut (approximately 1/16 of an inch between peaks and valleys) in one pass. The equipment shall include suitable provisions for the application of water to prevent dusting.

Finished Cut (Automated or Manual)

The rumble strips shall have finished dimensions of 7” (+/- 1/2”) wide in the direction of travel and shall be a 16” (+/- 1/2”) long measured perpendicular to the direction of travel. The depressions shall have a concave circular shape with a minimum 1/2” depth at center (maximum allowable depth is 5/8” measured to a valley). The rumble strips shall be placed in relation to the roadway according to the patterns shown in the plans or on the Rumble Strip Details. Alignment of the edge of the cut shall be checked and verified by the Engineer.

The cutting tool shall be equipped with guides to provide consistent alignment of each cut in relation to the roadway.

The Contractor shall pick up any waste material resulting from the operation in a manner acceptable to the Engineer. This waste material shall be disposed of in accordance with Subarticle 2.02.03-10(a).

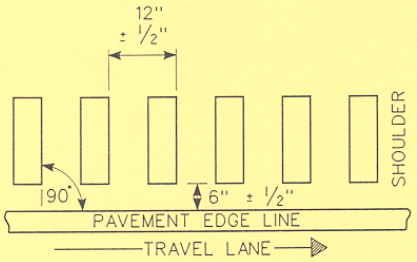
The work area shall be returned to a debris-free state prior to re-opening to traffic.

The Contractor shall provide all traffic control according to the Maintenance and Protection of Traffic Specification included elsewhere in the contract.

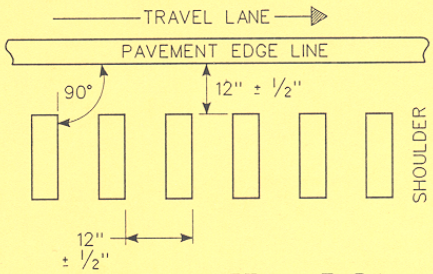
Method of Measurement:
This work will be measured for payment by the actual number of feet of shoulder where the rumble strips are placed and accepted. This distance shall be measured longitudinally along the edge of pavement with deductions for bridge decks, acceleration and deceleration lanes, drainage structures, loop detector sawcut locations, and other sections where the rumble strips were not installed.

Basis of Payment:
This work will be paid for at the Contract unit price per foot for "Rumble Strips - Automated" or "Rumble Strips - Manual." The price shall include furnishing all equipment, tools, labor, a technical representative and work incidental thereto and also disposal of any waste material resulting from the operation. The Contractor will not be paid under the item "Rumble Strips - Manual" if the field conditions allow for the use of the "Rumble Strips - Automated" item, even if the manual method was used.

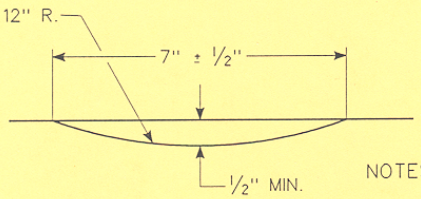
DETAILS AND SECTIONS OF RUMBLE STRIPS



LOCATION DETAIL (TYP.)
LEFT SHOULDER



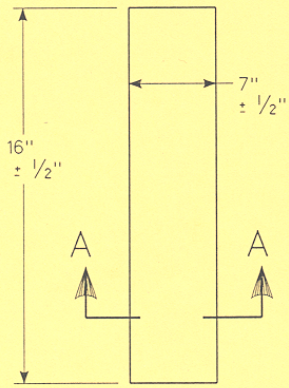
LOCATION DETAIL (TYP.)
RIGHT SHOULDER



SECTION A-A
NO SCALE

NOTES:

1. RUMBLE STRIP ALIGNMENT SHALL GENERALLY BE STRAIGHT AND OFFSET APPROXIMATELY 6" IN THE LEFT SHOULDER AND 12" IN THE RIGHT SHOULDER FROM THE OUTER EDGE OF THE EDGE LINE AND SHALL BE AT LEAST 12" FROM THE LONGITUDINAL JOINT IN COMPOSITE PAVEMENTS. THIS OFFSET MAY BE ADJUSTED TO ACCOMMODATE VARIATIONS IN THE EDGE LINE AND THE SHOULDER WIDTH.



PLAN DETAIL

FILE: RUMBLE.MDS

CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUR. OF ENGINEERING & HWY. OPERATIONS
DIVISION OF TRAFFIC ENGINEERING

RUMBLE STRIP DETAILS

ENGINEER Erika B. Smith DATE 10-18-99

SUBMITTED Stephen J. Masiatka DATE 10-20-99
TRAFFIC SUPERVISING ENGR.

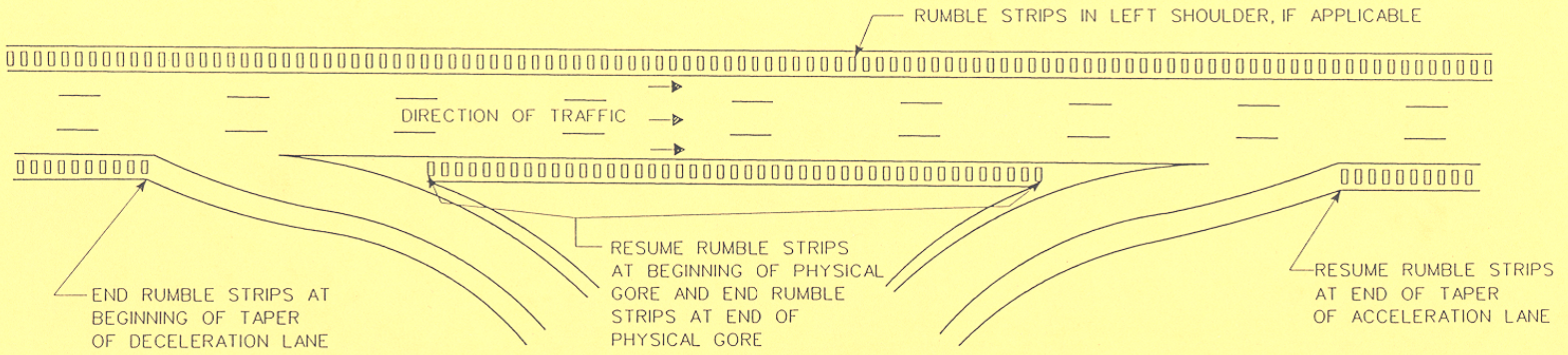
APPROVED _____ DATE 10-20-99
PRINCIPAL ENGINEER

SCALE - NONE

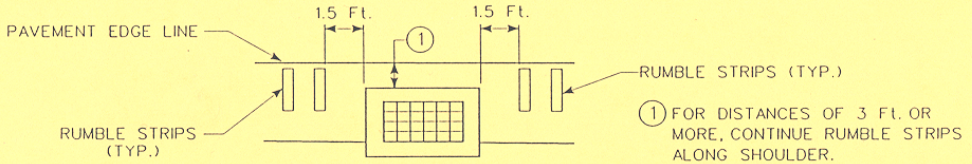
ITEM # 0406287A
ITEM # 0406288A

3 OF 4

TYPICAL TREATMENTS FOR INSTALLING RUMBLE STRIPS

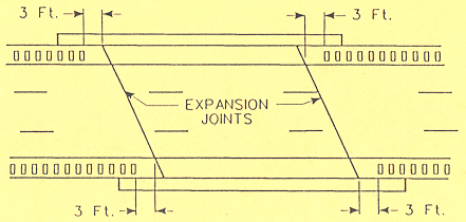


TYPICAL TREATMENT FOR RAMPS



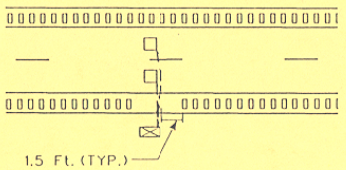
TYPICAL TREATMENT FOR OBSTRUCTIONS
(I.E. CATCH BASINS OR MANHOLES)

FILE: RUMBLE.MDS



TYPICAL TREATMENT FOR BRIDGES

NOTE: NARROW SHOULDERS APPROACHING BRIDGES MAY RESULT IN ENDING THE RUMBLE STRIPS AT THE GUIDE RAIL APPROACH



TYPICAL TREATMENT FOR
LOOP DETECTOR SAWCUT LOCATIONS

SCALE - NONE

CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUR. OF ENGINEERING & HWY. OPERATIONS
DIVISION OF TRAFFIC ENGINEERING

TYPICAL TREATMENTS FOR INSTALLATION OF RUMBLE STRIPS

ENGINEER Erika D. Smith DATE 10-18-99

SUBMITTED Stephen J. Nosetka DATE 10-20-99
TRANS. SUPERVISING ENGR.

APPROVED _____ DATE 10-20-99
PRINCIPAL ENGINEER

4 OF 4

ITEM # 0406287A

ITEM # 0406287A

Rev. Date 10/99

ITEM #0406289A - REMOVAL OF RUMBLE STRIPS

Description:
Work under this item shall consist of removing rumble strips through milling and repaving with hot mix asphalt (HMA) where shown on the plans or where directed by the Engineer, and in conformance with these specifications. The surface lift of the existing pavement shall be removed by milling out the existing rumble strip to a depth of 1.5 to 2.5 inches. The milled surface shall be swept by hand or machine and then be blown clean with compressed air or a hot air lance. Tack coat is to be applied to the milled surface and any vertical or semi-vertical walls formed by the milling. The milled out area shall then be filled and compacted with HMA S0.375.

Definitions:
Surface lift of pavement: The thickness of the last lift of pavement placed prior to performing crack sealing. A lift is defined as single bituminous-concrete mixture placed at a defined thickness in a single paver pass (or by handwork.)

Materials:
Materials for this work shall consist of the following:

Hot-mix Asphalt (specifically HMA S0.375) conforming to the requirements of Sections 4.06 and M.04 of the Standard Specifications.

Tack coat conforming to the material requirements for tack coat in Sections 4.06 and M.04 of the Standard Specifications.

Equipment:
Equipment for this work shall include, but is not limited to, the following:

Milling machine – A milling machine designed and built for milling HMA pavements. It shall be self propelled with sufficient power, traction, and stability to maintain depth.

The rotary drum of the machine shall utilize carbide tip tools spaced not more than 5/8 inches apart. Use of a fine-milling drum with a tighter tooth spacing of 0.3 inches is desirable, but optional. The forward speed of the milling machine shall be limited to no more than 45 feet/minute. The tools on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture. It must include dust control equipment during the removal process.

It shall be capable of removing the existing pavement to a width of 2 to 10 inches wider than the rumble strip.

A wider milling width may be used in cases where two rumble strips are located near and parallel to each other, as may occur in a median area; see Construction Methods.
Sweeper – A hand broom is acceptable for smaller areas when approved by the Engineer. If a mechanized sweeper is used, it shall be equipped with a water tank and be capable of removing the

millings and loose debris from the surface. Other sweeping or vacuum type equipment may be provided in lieu of the sweeper where acceptable by the Engineer.

Air compressor – The unit shall consist of an air compressor capable of producing 100 psi, oil free, compressed air for blowing the milled pavement surface clean.

Hot air lance – The unit shall be designed for cleaning and drying the pavement surface. It shall consist of an air compressor capable of delivering 100 psi, oil free heated air. The compressed air emitted from the tip of the lance shall be flame free and be capable of achieving a temperature of at least 1500°F.

Paving and compaction equipment – All equipment used to place and compact the hot mix asphalt required for this work shall meet the requirements of Section 4.06 of the Standard Specifications, except no grade and slope control shall be required. Also, due to the nature of this work, it is expected that much of the placement of hot mix asphalt will require hand work. Either vibratory plate compactors or rollers may be used for compaction.

Construction Methods:
The Contractor shall pre-mark the location of the beginning and ending points of the sections, prior to the removal of the rumble strips. The Engineer shall review and approve the limits of removal.

The width of milling shall be as specified on the Plans or other specifications. If no other width specification exists, the width of milling shall be 2 to 10 inches wider than the existing rumble strip. Rumble strips are typically about 16 inches wide. If there are two rumble strips located near and parallel to one another, as may occur in median areas, and if they both can be removed by a single pass of a wider milling machine without adversely affecting drainage, safety, or quality of results, then a wider milling machine may be used. In this case the length measured for pay will be the sum of the lengths of the two individual rumble strips. Milling widths wider than specified above may be used with the written permission of the Engineer.

The depth of removal shall be as shown on the Plans, or as detailed in specifications, or as directed by the Engineer, generally from 1.5 to 2.5 inches. The intent is to remove the surface lift. If there are no Plans or other specifications, mill 1.5 to 2.5 inches as needed to match the thickness of the surface lift. The Engineer may alter the milling depth based on conditions discovered as work is in progress. It is expected that the milling depth will not exceed 2.5 inches. If the surface lift is 3 inches thick and it is in good condition, as determined by the Engineer, mill only 1.5 inches deep, unless directed otherwise by the Plans, project specifications, or Engineer.

As specified in the requirements for milling, the milled surface shall be swept clean (by hand if necessary.) Once all millings are removed by sweeping, the milled areas shall be allowed to dry if necessary. Any moisture in or on the milled areas must be allowed to evaporate or be removed with the assistance of a hot air lance as specified above. Once the milled area is deemed dry by the Engineer it shall be blown with compressed or hot lance air, as specified above, so that no debris or dust is present on or within the milled area.

Once deemed clean by the Engineer, the milled area, including the sides/walls of the milled area, shall receive an application of tack coat as specified above and in Section 4.06 of the Standard Specifications.

After the tack coat has had sufficient time to cure or break, HMA S0.375 (Superpave Level 2) shall be placed and compacted to the requirements above and in Section 4.06 of the Standard Specification. It shall be compacted to match the elevation of the surrounding pavement surface.

At all times the Contractor is required to meet the density and compaction and all other requirements specified in Sections 4.06 and M.04 of the Standard Specifications and any supplementals that have been issued by the bid date of the project.

The Contractor shall resurface the milled area prior to opening the roadway to traffic. The milled area shall be swept, cleaned with compressed air, tacked and repaved in the same day.

Precaution should be taken to avoid damage to the existing roadway materials that are to remain in place. If damage occurs, it must be repaired by the Contractor at no additional cost to the State. The methods employed in performing the work and all equipment, tools, machinery and plant used in handling material and executing any part of the work shall be subject to the approval of the Engineer before the work is started; and whenever found unsatisfactory, it shall be changed and improved as required by the Engineer.

The Contractor shall pick up any waste material resulting from the operation in a manner acceptable to the Engineer. This waste material shall be disposed of in accordance with Subarticle 2.02.03-10(a).

Method of Measurement:
This work will be measured for payment by the actual number of linear feet of rumble strips removed. This distance shall be measured longitudinally along the edge of pavement with deductions for bridge decks, acceleration and deceleration lanes, drainage structures, loop detector sawcut locations, and other sections where the rumble strips were not previously installed. If two rumble strips are near one another and are removed by a single milling machine pass, the length measured for pay will be the sum of the lengths of the two rumble strips.

Basis of Payment:
This work will be paid for at the Contract unit price per linear foot for "Removal of Rumble Strips." The price shall include the removal of the existing rumble strips, furnishing all materials, placement, and compaction of the HMA, equipment, tools, labor, and work incidental thereto and also disposal of any waste material resulting from the operation.

Pay item	**Pay Unit**
Removal of Rumble Strips	L.F.

ITEM #0503151A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 1)
ITEM #0503152A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 2)

Work under this item shall conform to the requirements of Section 5.03, amended as follows:

5.03.01-Description: Delete the first two paragraphs and replace with the following:

Work under this item shall consist of the removal and satisfactory disposal of the superstructure to the limits identified on the plans. Those items to be removed and disposed of shall include, but not be limited to: precast concrete beams, concrete diaphragms, concrete deck, waterproofing materials, bridge deck overlay, bridge parapets, metal beam rail, metal fencing, abandoned conduits, curbing, light poles and their concrete pedestals, and bearings as shown on the plans or as directed by the Engineer.

Work under this item also consists of storage of the paint debris collected under this item.

5.03.03-Construction Methods: Add the following:

1. Removal of Superstructure:

   a. The Contractor shall submit to the Engineer for review in accordance with Article 1.05.02, his proposed demolition sequence together with working drawings, and calculations showing the stability analysis of the superstructure during all stages of removal, and for debris shielding. Proper supports shall be provided, as necessary, to stabilize all structural members during the removal process. Acceptance of the Contractor's plans shall not be considered as relieving the Contractor of any responsibility.

   b. The Contractor shall provide adequate debris shielding below the structure to prevent debris, tools and/or other materials from dropping into the areas below the structure. The Contractor shall submit working drawings for the debris shielding for any work that is being done above the Amtrak right-of-way.

   c. The Contractor's means and methods for removal of all superstructure elements shall be clearly shown on the working drawings. Crane placements, pick weights, saw cutting limits and methods and all other necessary information to convey and enumerate the demolition process shall be provided as part of the working drawing submittal.

   d. All working drawings and associated plans and calculations to be signed and sealed by a Professional Engineer licensed to practice in the State of Connecticut.

   e. A suggested method for superstructure removal is shown on drawings. The Contractor may propose an alternate method, subject to the approval by the

Engineer. The alternate method is to conform to all requirements described in drawings, specifications, special provisions and will need to be approved by Amtrak.

f. Before beginning removal of superstructure in all spans, the Contractor must have received approval of his proposed method of superstructure demolition and temporary protective barrier designs where required; and must have installed any temporary protective barriers required to satisfy the plans and specifications. The extent and limits of protective barriers is to prevent all construction debris, material, tools, equipment or any other waste from entering into all areas below the bridge within the railroad right-of-way.

g. All material that is not specified for salvage shall become the property of the Contractor and shall be removed and disposed of off-site by him. The Contractor is responsible for any fees and permits necessary to dispose of all materials removed as part of this item. The Contractor is responsible for the cost and securing of all permits that may be required to transport all material removed under this item to the disposal site.

h. Material designated for salvage shall be removed by methods that shall not cause damage to the salvaged material.

i. Material designated to be salvaged shall be removed, delivered and off-loaded by the Contractor at a location specified by the Engineer. With approval of the Engineer, the existing protective metal rail may be reused and relocated as “Temporary Protective Fence (Bridge)”

j. The superstructure removal shall not result in damage to any permanent construction (new or existing) nor to adjoining property. If any damage does occur, it shall be repaired by the Contractor to the satisfaction of the Engineer at no additional expense to the State.

All work shall proceed as directed by and to the satisfaction of the Engineer in accordance with the details shown on the plans and the requirements of the Special Provisions "Maintenance and Protection of Traffic" and "Prosecution and Progress," contained elsewhere in these Specifications.

5.03.04-Method of Measurement: Delete the article and replace with the following:

This work, being paid for on a lump sum basis per site, will not be measured for payment.

5.03.05-Basis of Payment: Delete the second, third and fourth paragraphs and replace with the following:

This work will be paid for at the contract lump sum price for "Removal of Superstructure (Site No.__)", for the site number specified, which price shall include the removal and disposal of the

superstructure components, as herein described, and all equipment, tools and labor incidental thereto.

Pay Item	Pay Unit
Removal of Superstructure (Site No.__)	L.S.

this item not in estimate

Rev. Date 10/09/02

revised in the January 2016 Supplement - no need to add S.P.

ITEM # 0504009A – RAILROAD PROTECTION

Section 5.04 "Railroad Protection" is amended as follows:

Article 5.04.04 – Method of Measurement:

Only Railroad Protection services approved by the Engineer will be measured for payment. Railroad Protection services will be measured for payment by the actual number of hours for each person rendering services in accordance with these specifications. Railroad Protection services utilized by the Contractor for which the Engineer did not approve or deems not necessary for the proper completion of the project will not be measured for payment.

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Article 5.04.05 - Basis of Payment:

The first paragraph is hereby deleted and replaced by the following:

The sum of money shown on the Estimate and in the itemized proposal as "Estimated Cost" for this work will be considered the bid price even though payment will be made as described below. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used to determine the total amount for the contract.

"Railroad Protection " will be paid for at the actual hourly rate charged (monthly statement or receipted bills from the entity which actually provided the services) only for railroad protection services which have been approved by the Engineer, plus a five percent (5%) markup. This price shall include all work, material and services provided by the railroad for protective services required by the operations of the Contractor on, over, under or adjacent to the railroad.

Pay Item	**Pay Unit**
Railroad Protection	Est.

ITEM # 0521021A - STEEL-LAMINATED ELASTOMERIC BEARINGS

Description: Work under this item shall consist of furnishing and installing steel-laminated elastomeric bearings as shown on the plans, as directed by the Engineer and in accordance with these specifications.

Materials:

1. Elastomer: The elastomeric compound, used in the construction of the bearings, shall contain only virgin polychloroprene (Neoprene) as the raw polymer. The elastomer compound shall be low temperature grade 3 (as defined by the testing requirements), have a Shore "A" Durometer hardness as shown on the plans and meet the requirements of the AASHTO LRFD Bridge Construction Specifications.

S-31 plan note has 50

The elastomeric shims shall be neoprene, with a Shore "A" Durometer hardness of 60 and a low temperature grade 3, 1/16" and 1/8" thick and conform to the requirements of the AASHTO LRFD Bridge Construction Specifications.

2. Steel Laminates: The internal steel laminates, used for reinforcement, shall be mild, rolled steel conforming to ASTM A570, Grade 36 or 40, ASTM A611, Grade C or D, or an approved equal.

AASHTO M270 on plans

3. Fabrication and Fabrication Tolerances: The fabrication and fabrication tolerances of elastomeric bearings shall conform to the requirements of the AASHTO LRFD Bridge Construction Specifications.

If guide pins or other devices are used to control the side cover over the steel laminates, any exposed portions of the steel laminates shall be sealed by vulcanized patching.

4. Testing: The materials for the elastomeric bearing and the finished bearings themselves shall be subjected to testing. The testing shall conform to the requirements of the AASHTO LRFD Bridge Construction Specifications.

Test bearings, in addition to the bearings shown on the plans, shall be furnished for each type (size and thickness) of bearing for destructive testing.

5. Marking: Each steel-laminated elastomeric bearing shall have marked on it, with indelible ink, the following: the manufacturer's identification code or symbol, and the month and year of manufacture, the orientation, order number, lot number, bearing identification number, and elastomer type and grade (Neoprene, Grade 3). The markings should be placed on a side of the bearing that is visible after installation.

6. Certification: The Contractor shall furnish a Certified Test Report, confirming that the elastomeric bearings satisfy the requirements of these specifications, in conformance with the requirements set forth in Article 1.06.07.

7. Adhesive: The adhesive, for bonding the shims, shall be a long lasting, high strength, cold applied, air cured, water and heat resistant material specifically formulated for bonding neoprene and shall meet the following requirements:

Property	Requirement	ASTM Test Procedure
Adhesion	30 lbs/in.	D429, Method B
Hardness	50 ± 5 Shore A points	D2240
Tensile Strength, min	1800 psi	D412
Elongation before breaking, min.	750 %	D412

Construction Methods: Before fabricating any materials, the Contractor shall submit shop drawings to the Engineer, for review and approval, in accordance with Subarticle 1.05.02. These drawings shall include, but not be limited to, the following information: manufacturers name, complete details of the bearings, material designations, nominal hardness of the elastomer, the quantity of bearings required, including test bearings, and the location of the bearing identification.

Bearing areas upon which the elastomeric bearings, will be set shall be cleaned of all debris. Bearing areas shall be carefully finished, by grinding if necessary, to a smooth, even, level surface at the required elevation, and shall show no variations from a true plane greater than 1/16 of an inch over the entire area upon which the elastomeric bearings are to rest.

The elastomeric bearings shall be installed as shown on the plans. The elastomeric bearings shall be installed when the temperature of the ambient air and the bearings is between 40°F to 80°F and has been within this range for at least 2 hours.

Adhesive bonding of the elastomeric bearings to steel and concrete surfaces is not permitted.

Welding will not be permitted with the elastomeric bearings in place unless there is more than 1 1/2" of steel between the weld and the elastomer. In no case shall the elastomer be exposed to temperatures greater than 400°F. Welding shall conform to the requirements of Subarticle 6.03.03-6.

s/b 6.03.03-3(c) - see supplements

The elastomeric bearings shall bear uniformly on all surfaces under full dead load. If uniform bearing is not present, the gaps beneath the bearing shall be filled with elastomeric shims. The Contractor, in the presence of the Engineer, shall measure the gaps to determine the limits of the areas requiring shims.

The Contractor shall raise the superstructure and install shims as required to provide uniform bearing of the bearings. The individual shims shall be bonded to the elastomer portion of the bearing with adhesive applied over the entire shim interface. The surface preparation, application and curing of the adhesive shall be in accordance with the manufacturers recommendations. If shims in excess of 1/8" are required, multiple shims shall be bonded together. Shimming of areas that vary in thickness shall be done by stepping the shims.

Method of Measurement: This work will be measured for payment by the number of cubic inches of elastomeric bearing pads, installed and accepted. No allowance shall be made for test bearings.

Basis of Payment: This work will be paid for at the contract unit price per cubic inch of "Steel-Laminated Elastomeric Bearings", complete in place, which price shall include all materials, equipment, tools and labor incidental thereto, including all the cost of furnishing test pads.

Pay Item	Pay Unit
Steel-Laminated Elastomeric Bearings	C.I.

ITEM # 0601032A – ROADWAY PARAPET WALL

Description: This item will consist of furnishing and constructing a roadway parapet wall comprised of cast-in-place concrete components at the locations, grades, and to the dimensions and details shown on the contract plans, and in accordance with these specifications.

Materials:

Subbase shall conform to the requirements of Article M.02.06, Grading “B”.

Reinforcing steel shall conform to the requirements of ASTM A615, Grade 60.

Cast-in-place concrete shall conform to the requirements of Article M.03.01. Concrete shall conform to the requirements of Class "A" Concrete with a minimum 28 day compressive strength of 3000 psi.

see S-02 note (s/b Class "F")

Joint sealant shall be a single component non-sag silicone sealant that conforms to the requirements of ASTM D5893.

Construction Methods:

Subbase shall be placed in accordance with the requirements of Article 2.12.03.

Cast-in-place concrete shall be constructed as shown on the plans and in accordance with the requirements of Article 6.01.03.

Sleeves and detailing to accommodate the metal beam rail anchorage shall be cast with the roadway parapet walls.

Method of Measurement: This work will be measured for payment along the centerline of the top of the roadway parapet wall and will be the actual number of linear feet of roadway parapet wall installed and accepted.

Basis of Payment: This work will be paid for at the contract unit price per linear foot for "Roadway Parapet Wall" as shown on the plans, complete in place, which price shall include all reinforcing steel, concrete materials, penetrating sealer protective compound, transportation, equipment, tools and labor incidental thereto.

Excavation associated with the placement of roadway parapet wall shall be paid under the respective item.

The furnishing and placement of subbase shall be paid under the respective item.

The furnishing and placement of fence anchorages located within the wall proper shall be paid under the respective item.

Pay Item	Pay Unit
Roadway Parapet Wall	L.F.

ITEM #0601097A – VARIABLE DEPTH PATCH

Description: Work under this item shall consist of removing loose, deteriorated concrete, and concrete overlaying hollow areas, and applying a cementitious mortar to these areas as well as spalled and scaled areas as shown on the plans, as directed by the Engineer, and in accordance with these specifications.

Materials: The cementitious mortar shall be one of the following, or an approved equal:

5 Star Structural Concrete V/O
Manufactured by: Five Star Products, Inc.
750 Commerce Drive
Fairfield, CT 06825

Re-crete 20 Minute Set
Manufactured by: Dayton Superior Specialty Chemical Corp.
4226 Kansas Avenue
Kansas City, KS 66016

Emaco S88 CI
Manufactured by: BASF Building Systems
889 Valley Park Drive
Shakopee, MN 55379

The single component zinc-rich shall conform to Federal Specification TT-P-641, Type 1, and shall be brush applied in two coats.

Certification: A Materials Certificate shall be required in accordance with Article 1.06.07, certifying the conformance of this material to the requirements set forth in this specification.

Construction Methods: Before any concrete is removed, the Engineer shall perform an inspection to determine the exact limits and locations of all areas to be repaired.

The perimeter of each deteriorated area shall be squared up to a minimum of 1/2-inch deep by chiseling or sawcutting. Care shall be taken not to cut existing reinforcing.

Loose and deteriorated concrete and hollow areas shall be chipped away back to sound concrete. The exposed concrete surfaces shall be thoroughly sandblasted and vacuumed immediately prior to applying the mortar.

All surfaces of exposed concrete and reinforcing steel shall be free of oil, solvent, grease, dirt, dust, bitumen, rust, loose particles, and foreign matter. Prior to sandblasting of concrete and steel surfaces, all petroleum contamination on these surfaces shall be removed by an appropriate solvent or detergent cleaning operations.

All compressed air equipment used in cleaning shall have properly sized and designed oil separators,

attached and functional, to assure the delivery of oil-free air at the nozzle.

Particular care shall be taken where reinforcing steel is uncovered, not to damage the steel or its bond in the surrounding concrete. Pneumatic tools shall not be placed in directed contact with reinforcing steel. Maximum 15 lb. size hammers shall be used for general chipping and removal. Exposed reinforcing steel shall be sandblasted in accordance with SSPC-SP-6, Commercial Blast Cleaning, to remove all contaminants, rust and rust scale.

All exposed blast-cleaned reinforcing steel shall be coated with two coats of the single component zinc-rich primer, brush applied (Note: the second coat shall only be applied after the first has dried). Applications of the zinc primer shall be in accordance with the manufacturer's printed instructions.

If the existing reinforcing steel is severely corroded or damaged, the Engineer ~~all~~ shall be notified immediately. Adequate measures shall be taken by the Contractor to prevent concrete chips, tools and materials from entering into adjacent roadway lanes or dropping to areas below the structure. When using sandblasting equipment, all work shall be shielded for the protection of the public. All debris shall be promptly swept up, removed and satisfactorily disposed of by the Contractor from the site.

All mixing and application of the mortar shall be done in strict accordance with the printed instructions supplied by the manufacturer and as directed by the Engineer.

At the time of mortar application, the concrete surfaces against which this material is to be placed shall be sound, tight and thoroughly roughened by the removal and sandblasting procedures specified above. The exposed concrete surfaces shall be dampened with fresh water (saturated surface dry) immediately prior to placement of the mortar. The minimum ambient and patched area surface temperatures shall be 45° F and rising at the ~~tie~~ time of mortar application.

The mortar shall be packed into the substrate, filling all pores and voids, then forced against the edges of the repair, working toward the center. After filling the voids, the mortar shall be compacted and the surfaces struck off with a steel trowel to match the original contour of the existing concrete.

A fine spray mist of water shall be used to aid the cure of the patches by preventing the surface from drying for a minimum of 2 hours.

Cured patches shall be sounded by the Engineer to detect the presence of any hollow spots. Such spots shall be removed and replaced by the Contractor at his own expense until an acceptable patch is in place.

Method of Measurement: This work will be measured for payment by the actual number of cubic feet of cementitious mortar incorporated into the completed and accepted work.

Basis of Payment: This work will be paid for at the contract unit price per cubic foot for "Variable Depth Patch", complete in place, which price shall include removal of loose and deteriorated concrete, sawcutting or chiseling, sandblasting, disposal of removed concrete and preparation materials, zinc primer on the reinforcing steel, and all materials, equipment, tools, labor and work incidental thereto.

Pay Item - Pay Unit table missing

ITEM #0602936A - DRILLING AND GROUTING REINFORCING BARS

Description:

Work under this item shall consist of drilling, coring or a combination of coring and drilling of holes in the existing structural concrete or masonry and grouting reinforcing bars into the holes. All work shall be as shown on the plans and as directed by the Engineer.

Materials:

The grout shall be a non-shrink grout conforming to Article M.03.05.

Prior to fabricating any materials, the Contractor shall submit manufacturer's specifications and installation for the chemical anchoring material to the Engineer in accordance with Article 1.05.02. A Materials Certificate shall be required for the adhesive bonding material in accordance with Article 1.06.07, certifying the conformance of this material to the requirements stated herein.

Construction Methods:

Holes for the reinforcement shall be drilled or cored, and shall be located and sized as shown on the plans. The holes shall clear the existing reinforcement as applicable and provide the minimum cover as shown on the plans. A pachometer shall be used to locate existing reinforcing steel where drilling in reinforced concrete is required. If existing reinforcing is encountered during the drilling operation, the holes shall be relocated and the incomplete holes shall be filled with grout and finished smooth and flush with the adjacent surface.

Unless noted on the plans, the depth and diameter of a hole shall conform to the grout manufacturer's recommendations for the diameter of the rebar being anchored such that the grouted rebar will be able to develop in tension 125 percent of its specified yield strength. The minimum compressive strength of the existing concrete shall be assumed to be 3,000 psi for purposes of calculating minimum embedment depths unless otherwise noted.

Hole drilling methods shall not cause spalling, cracking or other damage to the existing concrete. The Contractor is responsible for the type of drilling or coring equipment used and those areas damaged by the Contractor during drilling or coring shall be repaired by him in a manner suitable to the Engineer and at no expense to the State. If the drilling method causes spalling, cracking or other damage, the contractor shall stop work with that method and submit another method for approval prior to proceeding further.

In some cases, drill holes will be required at intersecting angles. Plan out the location of the holes to avoid drilling through newly placed bars or holes.

Each finished hole shall be blown clean with an air jet, then flushed with clean water. In the water-flushing operation, the pressure hose shall be extended to the bottom/end of the hole several times

and withdrawn gradually each time. After flushing, the holes shall be left full of clean water for a minimum period of 2 hours. Immediately prior to the grouting operation, all water shall be removed and the free water on the wall of the hole shall be removed with an air jet or clean rags.

The grout shall be mixed and placed strictly in accordance with the recommendations of the manufacturer. The grout shall completely fill the space around the reinforcing bar.

Method of Measurement:

This work will be measured for payment by the number of linear feet of drilled or cored holes in which bars are embedded and accepted. Holes encountering reinforcing steel that are terminated and patched will not be measured for payment.

Basis of Payment:

This work will be paid for at the contract unit price per linear foot for "Drilling and Grouting Reinforcing Bars", which price shall include drilling or coring and preparing holes, and grouting the reinforcing bars. It shall also include all material, except reinforcement and all equipment, tools and labor incidental thereto.

Reinforcing bars will be paid for under item "Deformed Steel Bars - Epoxy Coated".

Pay Item	Pay Unit
Drilling and Grouting Reinforcing Bars	L.F.

ITEM #0601954A – EPOXY INJECTION CRACK REPAIR

Description: This item shall consist of surveying the existing areas, locating all cracks to be repaired under this item, and rebonding the cracked concrete structures with a two component modified epoxy resin system injected into the cracker structure under low pressure using continuous positive displacement metering and mixing equipment as directed in accordance with these specifications.

Work under this item is limited to crack widths greater than 1/16" and less than 1/4". The Contractor shall not perform any repair work without prior approval by the Engineer for locations, limits, and type of repairs.

Materials: The modified epoxy resin shall be a pre-qualified epoxy resin (see Appendix A). A Materials Certificate and a Certificate of Compliance in according with Article 1.06.07 shall accompany each batch or lot of the material delivered to the job site, to verify the epoxy resins conformance with the manufacturers supplied infrared spectroscopy test results. A sample of liquid epoxy resin component A and B shall be taken and shall consist of one pint of each batch of each component represented in each shipment. The samples shall be presented to the Laboratory a minimum of 14 calendar days before incorporation of any of the batch into the work. The Laboratory shall conduct the Infrared Spectroscopy Test on the samples (see Appendix A, attached). Each test result shall be compared to the test results on file with the Laboratory from the "Prequalification Procedures". Two materials are considered to be identical if all of the absorption points agree as to wavelength and relative magnitude of the peaks in comparison with the other points of absorption.

A batch of each component will be defined as that quantity of material that has been subjected to the same unit chemical or physical mixing process intended to make the final product substantially uniform.

Each component shall be packaged in steel containers not larger than 5 gallons in volume. The containers shall have lug type crimp lids with ring seals, shall be new, not less than 0.024-inch nominal thickness, and shall be well sealed to prevent leakage. If a lining is used in the containers it shall be of such character as to resist any action by the components. Each container shall be clearly labeled with the designation (component A or B), manufacturer's name, and date of manufacturer, batch number and the following warning:

CAUTION: This material will cause severe dermatitis if it is allowed to come in contact with the skin or eyes. Use gloves and protective creams on the hands. Should this material contact the skin, wash thoroughly with soap and water. Do not attempt to remove this material from the skin with solvents. If any gets in the eyes, flush for 10 minutes with water and secure immediate medical attention.

Any material, which shows evidence of crystallization or a permanent increase in viscosity or

settling of pigments that cannot be readily redispersed with a paddle, shall not be used.

Construction Methods: A survey shall be undertaken by the Contractor on the area designated to be repaired, under the direction and to the satisfaction of the Engineer, to determine the exact limits and location of the area to be repaired under this item.
At the time of mixing, components A and B and the substrate temperature shall be between 50° and 85° Fahrenheit, unless the material has been pre-qualified at a temperature less than 75° Fahrenheit, in which case this lesser temperature shall govern the use of the material. Any heating of the adhesive components shall be done by application of indirect heat. Immediately prior to filling the tanks of the mixing equipment, each component shall be thoroughly stirred with a paddle. Separate paddles shall be used to stir each component.

Injection ports shall be inserted in the cracks at intervals not less than the thickness of the concrete being injected. At the end of a crack or at a point where the thickness of the crack becomes less than .005 inches, the first port shall be half the distance from this point. The Contractor may use either surface injection ports or insertable injection ports as recommended by the manufacturer of the epoxy.

Drilling of the injection ports shall be done with a hollow drill bit to which vacuum is applied with an industrial vacuum cleaner (such as Black and Decker No. 95 Vackar or equivalent). The drill shall not contact any steel reinforcing or pre-stressing strands or ducts. A pachometer shall be used to locate the embedded steel.

Spacing of the ports shall be such that the injected adhesive will substantially fill the crack without excessive waste. If necessary to meet this requirement, the spacing of the ports shall be revised as approved by the Engineer as the injection process progresses.

The surface of the crack between ports shall be sealed with tape or other temporary surface sealant, which is capable of retaining the epoxy adhesive in the crack during pressure injection, and shall remain in places until the epoxy has hardened. Sealant tape and/or temporary surface sealant shall also be removed and any spillage of epoxy shall also be removed. No clean up on surfaces not generally viewed by the public will be required unless the surface sealant will interfere with subsequent surface treatments.

Epoxy adhesive shall be pumped into the cracks through the injection ports. The pump, hose, injection gun and appurtenances shall properly proportion and mix the epoxy and shall be capable of injecting the epoxy at a sufficient rate and pressure to completely fill all designated cracks. A suitable gasket shall be used on the head of the injection gun to prevent the adhesive from running down the face of the concrete. Pumping pressure shall be kept as low as practicable.

The temperature of the concrete shall not be less than 50° Fahrenheit at the time epoxy is injected, unless the epoxy has been pre-qualified at a lower temperature as hereinbefore provided, in which case the lower temperature shall govern.

For a crack with uniform thickness, the epoxy adhesive shall be forced into the first port at one end of the crack until adhesive runs in substantial quantity from the next adjacent port. The first port shall then be sealed and injection started at the next port. Injection shall then continue from port to port in this manner until the crack is fully injected.

Cracks with non-uniform thickness shall have the epoxy adhesive forced into the port at the widest separation in the crack until adhesive runs in substantial quantity from the two adjacent ports. The first port shall then be sealed and injection started at the adjacent port corresponding to the shortest length of the crack. Injection shall then continue from port to port in this manner until the short side of the crack is fully injected. Then, beginning with the port that is filled with epoxy adhesive but not sealed, injection shall continue from port to port until the crack is fully injected.

For slanting or vertical cracks, pumping shall start at the lower end of the crack. Where approximately vertical and horizontal cracks intersect, the vertical crack below the intersection shall be injected first. The ports shall be sealed by removing the fitting, filling the void with epoxy and covering with tape or surface sealant.

Before starting injection work and at 2-hour intervals during injection work when requested by the Engineer, a 3-fluid ounce sample of mixed epoxy shall be taken from the injection gun. Should these samples show any evidence of improper proportioning or mixing, injection work shall be suspended until the equipment or procedures are corrected.

Samples obtained above shall be used directly, without further stirring, to make test pieces for the Slant Shear Strength on Dry Concrete. One test piece shall be made at the beginning, middle and end of daily operations. The samples shall be allowed to cure for 7 days in the "Concrete Cylinder Curing Box". On the 7th day the samples shall be removed to the laboratory and tested in accordance with the requirements for Slant Shear Strength (see Appendix A, attached).

Each sample shall be numbered consecutively and dated (with a waterproof marker) and it shall be noted which sample represents which part of the structure.

Technical Advisor: The Contractor shall provide the Engineer with a notarized statement showing a specific record of epoxy injection repairs actually made by the Contractor and/or a specific record of training of his employees in epoxy injection repairs as taught by the manufacturer of the epoxy product. If the statement is not produced or is deemed insufficient by the Engineer, the Contractor shall obtain the services of a Technical Advisor who is employed by the manufacturer of the epoxy resin. The Technical Advisor shall assist the Engineer and the Contractor in the correct use of the injection resin. The Advisor shall be a qualified representative approved by the Engineer, and shall be at the site of the work when the work begins in connection with the epoxy injection and at such other times as the Engineer may request until completion of this item.

Method of Measurement: This work will be measured for payment by the number of linear feet, which have been designated by the Engineer to be injected and which were subsequently filled with epoxy, shall be measured.

Where cracks are designated for injection on opposite sides of a concrete member and the epoxy adhesive injected on one side penetrates through the members to completely fill the crack on the opposite side, payment will be made for the cracks in both sides as though injection had been performed on both sides, except that no payment will be made for such cracks on the opposite side that were not designated by the Engineer for injection.

Where a crack designated for injection extends around the corner of a concrete member, the length of crack on both faces will be measured for payment.

Basis of Payment: This work will be paid for at the contract unit price per linear foot for "Epoxy Injection Crack Repair", complete in place, which price shall include all work and services called for herein including all preparation, materials, equipment, tools, labor and cleanup incidental thereto.

Pay Item	Pay Unit
Epoxy Injection Crack Repair	L.F.

APPENDIX A

Prequalification Procedure

The Prequalification Procedure shall consist of the following test procedure on the mixed epoxy resin at a temperature of 77°F, unless the Contractor desires to use the material at a lower temperature than 50°F, in which case the lower temperature shall be used to condition the material and test pieces.

TEST: VISCOSITY

Requirements: 900 centipoise max. @20°F (±2°)
4,000 centipoise max. @any test temperature

Test Method: ASTM D 2393

TEST: GEL TIME (POT LIFE)

Requirement: 4 to 60 minutes

Test Method:

A. Apparatus

1. Unwaxed paper cups, 8 oz., 2¼ inches at base (Dixie Cup No. 4338 or equivalent).
2. Wooden tongue depressor with ends cut square (Puritan No. 705 or equivalent).
3. Stainless steel spatula with blade 6" x 1" and with end cut square.
4. Stopwatch, 1 second or smaller divisions.
5. Balance, 0.1 gram divisions.

B. Test Procedure

1. Condition both A and B components to required temperature (±2°F).
2. Measure proper volumes of well-mixed components A and B into an 8-oz. unwaxed cup to yield total mass of 60 (±2.0 grams).
3. Start stopwatch immediately and mix components for 60 seconds, stirring with a wooden tongue decompressor taking care to scrape the sides and bottom of the cup periodically.
4. Place the sample at the required temperature (±2°F) on a wooden bench top, which is free of excessive drafts.
5. Probe the mixture once with the tongue depressor every 30 seconds starting 4 minutes from the time of mixing.
6. The time at which a soft stringy mass forms in the cup is the gel time.

TEST: **SLANT SHEAR STRENGTH ON WET CONCRETE**

Requirements: 1700 psi min. after 7 days of cure in air at the required temperature (±2°F)

TEST: **SLANT SHEAR STRENGTH ON DRY CONCRETE**

Requirements: 4500 psi min. after 7 days of cure in air at the required temperature (±2°F)

TEST: **SLANT SHEAR STRENGTH**

A. Materials

1. Ottawa sand, ASTM C109
2. Portland cement, Type II
3. Water

B. Apparatus

1. Suitable mold to make diagonal concrete mortar blocks with a square base with 2-inch sides and having one diagonal face 2" x 4" starting about ¾-inch above the base. The diagonal faces of two such blocks are bonded together producing a block of dimensions 2" x 2" x 5".
2. Block made from the following composition:
   - Ottawa sand, ASTM C109 30.1 lbs.
   - Portland cement, Type II 12.1 lbs.
   - Water 4.8 lbs.

   Cure blocks 28 days in a fog room. Dry and lightly sandblast diagonal faces.

3. Suitable test press.

B. Test Procedure

Condition the components for 4 hours at the required temperature (±2°F). Without entrapping air, stir the separate components for 30 seconds and place the proper volumes of each component on a plate and mix with a spatula for 60 + 5 seconds. Apply a coat approximately 0.010-inch thick to each diagonal surface. Place four ⅛-inch square pieces of shim stock 0.012-inch thick on one block to control final film thickness.

Before pressing the coated surface together, leave the blocks so that the coated surfaces are horizontal until the epoxy reacts slightly to prevent excessive flow. Press diagonal surfaces of each block together by hand and remove excess epoxy adhesive.

Align the blocks so that the ends and sides are square and form a block 2" x 2" x 5". Use blocks of wood or metal against each 2" x 2" end, to keep diagonal faces from slipping until epoxy hardens.

After the required cure time, apply a suitable capping compound to each of the 2" x 2" bases, and test by applying a compression load with a Universal Test Machine or other suitable testing apparatus at the rate of 5000 lbs./min, until failure.

Report results in pounds per square inch

$$= \frac{\text{Load in Pounds}}{4}$$

For wet shear strength, soak another set of blocks in water for 24 hours at the required temperature (±2°F). Remove and wipe off excess water. Prepare, cure, and test sample according to above test procedure.

TEST: **TENSILE STRENGTH**

Requirements: 4500 psi Min.

TEST: **ELONGATION**

Requirements: 15% Max.

Test Method: TENSILE STRENGTH AND ELOGATION

A. Apparatus

1. Leveling table about 12" x 8" with removable rim ¼-inch thick by ½-inch wide.
2. Mylar or similar plastic sheeting 0.004-inches thick.
3. Air circulation oven capable of maintaining 158°F (±3°F).
4. Cutting die, Figure I
5. Thickness gauge, ⅛-inch.
6. Release agent, non-silicone type.

B. Procedure

1. Place Mylar sheet on leveling table.
2. Coat inside edge and bottom of rim with the release agent and secure to table with screws.

3. Level the table.
4. Mix sufficient volume of well-mixed component A and well mixed component B in the proper volumes so as to be able to form a layer ⅛-inch deep when placed inside the ring on the leveling table.
5. Introduce as few bubbles as possible during mixing.
6. Flush surface of epoxy with a heat gun or Bunsen burner to remove air bubbles on surface. Repeat if necessary.
7. Allow the specimen to cure for 18 hours at the required temperature (±2°F).
8. Remove specimen from table and strip off Mylar sheet. Cure specimen for 5 hours at 158°F (±3°F).
9. Allow specimen to cool to the required temperature and cut specimens using cutting die shown in Figure I.
10. Proceed as specified in ASTM D 638, using 0.2-inches/minute test rate and 1-inch gauge length.

TEST: **INFRARED SPECTROSCOPY**

Requirement: Infrared Spectroscopy Tests shall be obtained of Components A and B

Test Method: RECORDING SPECTROPHOTOMETER

A. Apparatus

1. Perkin–Elmer Model 137-B Infracord Spectrophotometer, automatic recording system from 2.5 microns to 15 microns with a two-speed recorder. Comparable results can be obtained with similar resolution.
2. Disk holder for a one-inch diameter disk.
3. Two sodium chloride crystal disks one-inch in diameter.
4. Sorvall SS-3 Automatic Superspeed Centrifuge, or comparable centrifuge, which is able to separate the liquid and solid phases of the epoxy components without previous dilution with solvents.

B. Procedure

1. Place about 15 grams of component A into a stainless steel centrifuge table.
2. Counterbalance with component B in a second centrifuge tube.
3. Centrifuge the two components at 17000 rpm until there is a supernatant liquid layer present in each tube. This takes 20 to 30 minutes.
4. Place a drop of component A liquid layer on a sodium chloride disk.
5. Place another sodium chloride disk over the drop, rotate, and press down until the liquid has flowed into a uniform layer of proper thickness between the two sodium chloride disks.
6. Place the disks in the holder and run an absorption curve with the infrared spectrophotometer.

7. More or less liquid may be used between the disks so as to produce a maximum absorption of 0.7 to 1.0 for the strongest absorption point on the curve.
8. Clean the disks with toluene and dry.
9. Repeat steps 4 through 8 with the liquid layer from component B.
10. Record each curve in order that they may be used for comparison purposes with lots of material delivered to the job site.

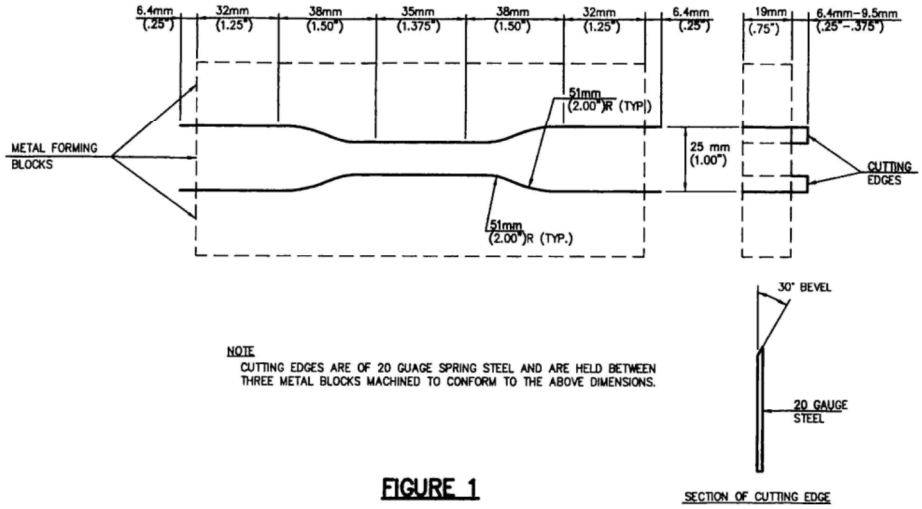


FIGURE 1
CUTTING DIE FOR TENSILE TEST
N.T.S.

ITEM #0707009A - MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)

Description: Work under this item consists of furnishing and installing a seamless elastomeric waterproofing membrane system applied to a concrete or steel surface as shown on the plans, in accordance with this specification and as directed by the Engineer. Work shall also include conditioning of the surface to be coated and all quality-control testing noted herein.

The completed membrane system shall be comprised of a primer coat followed by the membrane coating which is applied in one or two layers for a minimum total thickness of 80 mil (2 mm). This work shall also include an additional 40 mil (1mm) membrane layer with aggregate broadcast into the material while still wet.

Materials: The Contractor shall select a waterproofing membrane system from the Department's current Qualified Product List (QPL) for Spray-Applied Membrane Waterproofing System. All materials incorporated in the works shall meet the Manufacturer's specification for the chosen system. The Engineer will reject any system that is not on the QPL.

Materials Certificate: The Contractor shall submit to the Engineer a Materials Certificate for the primer and membrane in accordance with the requirements of Article 1.06.07.

Construction Methods: At least ten days prior to installation of the membrane system, the Contractor shall submit to the Engineer, the manufacturer's recommended procedure for preparing the deck surface, pre-treatment or preparing at cracks and gaps, treatment at curbs, vertical surfaces or discontinuities, applying the primer and membrane, and placing of aggregated coat. Procedures shall also include recommended repairs of system non-compliant issues identified during application. The system shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

A technical representative, in the direct employ of the manufacturer, shall be present on-site immediately prior to and during application of the membrane. The representative shall inspect and approve the surface prior to priming, and provide guidance on the handling, mixing and addition of components and observe application of the primer and membrane. The representative shall perform all required quality-control testing and remain on the Project site until the membrane has fully cured.
All quality-control testing, including verbal direction or observations on the day of the installation, shall be recorded and submitted to the Engineer for inclusion in the Project's records. A submittal of the quality-control testing data shall be received by project personnel prior to any paving over the finished membrane or within 24 hours following completion of any staged portion of the work.

1. Applicator Approval: The Contractor's membrane Applicator shall be fully trained and licensed by the membrane manufacturer and shall have successfully completed at least three spray membrane projects in the past five years. The Contractor shall furnish references from those projects, including names of contact persons and the names, addresses and phone numbers of persons who supervised the projects. This information shall be submitted to the Engineer prior to the start of construction. The Engineer shall have sole authority to determine the adequacy and compliance of the submitted information. Inadequate proof of ability to perform the work will be grounds to reject proposed applicators.

2. Job Conditions:

   (a) Environmental Requirements: Air and substrate temperatures shall be between 32°F (0°C) and 104°F (40°C) providing the substrate is above the dew point. Outside of this range, the Manufacturer shall be consulted.

   The Applicator shall be provided with adequate disposal facilities for non hazardous waste generated during installation of the membrane system. The applicator shall follow safety instructions regarding respirators and safety equipment.

   (b) Safety Requirements: All open flames and spark producing equipment shall be removed from the work area prior to commencement of application.

   "No Smoking" signs shall be visibly posted at the job site during application of the membrane waterproofing.

   Personnel not involved in membrane application shall be kept out of the work area.

3. Delivery, Storage and Handling:

   (a) Packaging and Shipping: All components of the membrane system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the products type and batch number.

   (b) Storage and Protection: The Applicator shall be provided with a storage area for all components. The area shall be cool, dry and out of direct sunlight and shall be in accordance with the Manufacturer's recommendations and relevant health and safety regulations.

   Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

   (c) Shelf Life - Membrane Components: Packaging of all membrane components shall include a shelf life date sealed by the Manufacturer. No membrane components whose shelf life has expired shall be used.

4. Surface Preparation:

   (a) Protection: The Applicator shall be responsible for the protection of equipment and adjacent areas from over spray or other contamination. Parapets and bridge joints shall be masked prior to application of the materials.

   (b) Surface Preparation: Sharp peaks and discontinuities shall be ground smooth. The surface profile of the prepared substrate is not to exceed 1/4 inch (6 mm) (peak to valley) and areas of minor surface deterioration of 1/2 inch (13 mm) and greater in depth shall also be repaired. The extent and location of the surface patches require the approval of the Engineer before the membrane system is applied.

   Surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae, growth, laitance, friable matter, dirt, bituminous products, and previous waterproofing materials. If required, degreasing shall be done by detergent washing in accordance with ASTM D4258.

   The surface shall be abrasively cleaned, in accordance with ASTM D4259, to provide a sound substrate free from laitance.

   Voids, honeycombed areas, and blow holes on vertical surfaces shall be repaired in the same manner.

   All steel components to receive membrane waterproofing shall be blast cleaned in accordance with SSPC SP6 and coated with the membrane waterproofing system within the same work shift.

5. Inspection and Testing: Prior to priming of the surface, the Engineer, Applicator and Manufacturer's technical representative shall inspect and approve the prepared substrate.

   (a) Random tests for deck moisture content shall be conducted on the substrate by the Applicator at the job site using a "Sovereign Portable Electronic Moisture Master Meter," a "Tramex CMEXpertII Concrete Moisture Meter" or approved equal. The minimum frequency shall be one test per 1000 s.f. (100 sq.m) but not less than three tests per day per bridge. Additional tests may be required if atmospheric conditions change and retest of the substrate moisture content is warranted.

   The membrane system shall not be installed on substrate with a moisture content greater than that recommended by the system's manufacturer, but shall not be greater than 6%, whichever is less.

   (b) Random tests for adequate tensile bond strength shall be conducted on the substrate using an adhesion tester in accordance with the requirements of ASTM D4541. The minimum frequency shall be one test per 5,000 s.f. (500 sq.m) but not less than three adhesion tests per bridge.

Adequate surface preparation will be indicated by tensile bond strengths of primer to the substrate greater than or equal to 150 psi (1.0 MPa) or failure in a concrete surface and greater than or equal to 300 psi (2.1 MPa) for steel surfaces.

If the tensile bond strength is lower than the minimum specified, the Engineer may request additional substrate preparation. Any primer not adequately applied shall be removed and a new primer applied at the Contractor's expense, as directed by Engineer.

(c) Cracks and grouted joints shall be treated in accordance with the Manufacturer's recommendations, as approved or directed by the Engineer.

6. Application:

(a) The System shall be applied in four distinct steps as follows:
   1) Substrate preparation and gap/joint bridging preparation
   2) Priming
   3) Membrane application
   4) Membrane with aggregate

(b) Immediately prior to the application of any components of the System, the surface shall be dry (see Section 5a of this specification) and any remaining dust or loose particles shall be removed using clean, dry oil-free compressed air or industrial vacuum.

(c) Where the area to be treated is bound by a vertical surface (e.g. curb or wall), the membrane system may be continued up the vertical, as shown on the plans or as directed by the Engineer.

(d) The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results, in accordance with the Manufacturer's recommendations or as approved or directed by the Engineer.

(e) A neat finish with well defined boundaries and straight edges shall be provided by the Applicator.

(f) Primer: The primer shall consist of one coat with an overall coverage rate of 125 to 175 s.f./gal (3.0 to 4.3sq.m/1) unless otherwise recommended in the manufacturer's written instructions.

All components shall be measured and mixed in accordance with the Manufacturer's recommendations.

The primer shall be spray applied using a single component spray system approved for use by the Manufacturer. If required by site conditions and allowed by the manufacturer, brush or roller application will be allowed.

The primer shall be allowed to cure tack-free for a minimum of 30 minutes or as required by the Manufacturer's instructions, whichever time is greater, prior to application of the first lift of waterproofing membrane.

Porous concrete (brick) may require a second coat of primer should the first coat be absorbed.

(g) Membrane: The waterproofing membrane shall consist of one or two coats for a total dry film thickness of 80 mils (2 mm). If applied in two coats, the second coat shall be of a contrasting color to aid in quality assurance and inspection.

The membrane shall be comprised of Components A and B and a hardener powder which is to be added to Component B in accordance with the Manufacturer's recommendations.

The substrate shall be coated in a methodical manner.

Thickness checks: For each layer, checks for wet film thickness using a gauge pin or standard comb-type thickness gauge shall be carried out typically once every 100 s.f. (9 sq.m). Where rapid set time of the membrane does not allow for wet film thickness checks, ultrasonic testing (steel surfaces only), calibrated point-penetrating (destructive) testing, in-situ sampling (cutout of small sections for measuring thicknesses), or other methods approved by the Engineer shall be employed for determination of dry film thickness. The measured thickness of each and every individual test of the membrane shall be greater than or equal to the required thickness.

Bond Strength: Random tests for adequate tensile bond strength shall be conducted on the membrane in accordance with the requirements of ASTM D4541. The minimum test frequency shall be one test per 5,000 s.f. (500 sq.m) but no less than three adhesion tests per bridge. Adequate adhesion will be indicated by tensile bond strengths of the membrane to the substrate of greater than or equal to 150 psi (0.7 MPa) or failure in a concrete surface and greater than or equal to 300 psi (2.1 MPa) for steel surfaces.

Spark Testing: Following application of the membrane, test for pin holes in the cured membrane system over the entire application area in accordance with ASTM D4787- "Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates." Conduct the test at voltages recommended by the manufacturer to prevent damage to the membrane.

Repair the membrane system following destructive testing and correct any deficiencies in the membrane system or substrate noted during quality-control testing in accordance with the manufacturer's recommendations to the satisfaction of the Engineer at no additional cost to the State.

(h) Repairs: If an area is left untreated or the membrane becomes damaged, a patch repair shall be carried out to restore the integrity of the system. The damaged areas shall be cut back to sound materials and wiped with solvent (e.g. acetone) up to a width of at least four inches (100 mm) on the periphery, removing any contaminants unless otherwise recommended by the manufacturer. The substrate shall be primed as necessary, followed by the membrane. A continuous layer shall be obtained over the substrate with a four inches (100 mm) overlap onto existing membrane.

Where the membrane is to be joined to existing cured material, the new application shall overlap the existing by at least four inches (100 mm). Cleaning and surface preparation on areas to be lapped shall be as recommended in the manufacturer's written instructions.

(i) Aggregated Finish:
1) Apply an additional 40 mil (1 mm) thick layer of the membrane material immediately followed by an aggregate coating, before the membrane cures, at a rate to fully cover the exposed area. The membrane and aggregate shall be fully integrated after the aggregate has been applied and the membrane cured.
2) Localized areas not fully coated shall be touched-up with additional membrane and aggregate as needed.
3) Remove loose and excess aggregate from the surface to the satisfaction of the Engineer and dispose of properly after application prior to allowing traffic onto finished surface or application of tack coat.

(j) Tack Coat:
Prior to application of a bituminous concrete overlay, the aggregated finish shall be coated with tack coat in accordance with Section 4.06.

7. Final Review: The Engineer and the Applicator shall jointly review the area(s) over which the completed System has been installed. Any irregularities or other items that do not meet the requirements of the Engineer shall be addressed at this time.

Method of Measurement: The quantity to be paid for under this item shall be the number of square yards (square meters) of waterproofed surface completed and accepted.

Basis of Payment: This item will be paid for at the contract unit price per square yard (square meter) of "Membrane Waterproofing (Cold Liquid Elastomeric)," complete in place, which price shall include all surface preparation, furnishing, storing and applying the system, technical representative and quality control tests, and any necessary repairs and remediation work as well as all materials, equipment, tools, labor incidental to this work.

Pay Item	Pay Unit
Membrane Waterproofing (Cold Liquid Elastomeric)	s.y. (sq.m)

Rev. Date 05/21/08

Section 7.16 Temporary Earth Retaining System inc. into January 2016 Supplement al

ITEM #0714050A - TEMPORARY EARTH RETAINING SYSTEM

Description: Temporary earth retaining system shall be any type of adequately braced temporary retaining wall such as temporary sheet piling which the Contractor elects to buil satisfy, and which does satisfy, the condition that existing facilities be properly retained du excavation or fill for the placement of substructure or other facilities. Temporary earth reta system shall be designed by the Contractor and constructed where shown on the plans. Thi system shall be removed upon completion of the permanent work, except that some section be left in place when so ordered by the Engineer.

Materials: Materials of steel sheet piling shall conform to the requirement of ASTM A 328. Timber sheet piling shall conform to the requirements of Subarticle M.09.01-1. Materials other than steel or timber, or a combination of these may be used provided they are properly designed for the purpose intended. Systems utilizing other material(s) shall conform to the manufacturer's specifications and project specifications. The parts list shall be furnished for the proprietary system and the Contractor shall provide the material certificates for the parts.

Construction Methods: Temporary earth retaining system shall be safely designed and shall be carried to adequate depths and braced as necessary for proper performance of the work. Construction shall be such as to permit excavation or fill as required. Interior dimensions shall be such as to give sufficient clearance for construction of forms and their inspection and for battered pile clearance when necessary. Movements of the system or bracing which prevent the proper completion of the substructure shall be corrected at the sole expense of the Contractor. No part of the temporary earth retaining system or bracing shall be allowed to extend into the substructure without written permission of the Engineer.

Working drawings and design calculations for temporary earth retaining system shall be submitted in accordance with the requirements of Article 1.05.02(2). The working drawings and design calculations shall be prepared, sealed, and signed by a Professional Engineer, licensed in the State of Connecticut. The furnishing of such plans shall not serve to relieve the Contractor of any part of his responsibility for the safety of the work or for the successful completion of the project.

Unless otherwise ordered by the Engineer, all parts of the temporary earth retaining system shall be removed upon completion of the work for which it was provided. The excavation shall be backfilled and properly compacted, prior to removal of the system unless otherwise permitted by the Engineer. Temporary earth retaining system may be left in place at the option of the Contractor if so permitted by the Engineer, provided that it is cut off at an elevation as directed by the Engineer and the cutoffs removed from the site.

Method of Measurement: Temporary earth retaining system will be measured for payment by the number of square feet of temporary retaining wall completed and accepted, as computed from the horizontal and vertical payment lines shown on the plans or as ordered. If no payment

limits are shown on the plans, the limits used for payment will be the actual horizontal limit of temporary earth retaining system installed and accepted, and the vertical limit as measured from the bottom of the exposed face of the wall system to the top of the retained earth behind the system. The measurement for temporary earth retaining system which is used as a common wall for staged construction will be the horizontal payment limit shown on the plans and the greater vertical dimension of the common wall face.

No measurement will be made of end extensions or returns necessary for the safety of the retained facility. Earth retaining system ordered left in place by the Engineer shall be measured in accordance with "Earth Retaining System Left in Place."

Earth retaining systems left in place solely at the Contractor's option, and with the Engineer's permission, will not have an additional payment at the contract unit price per square foot for "Earth Retaining System Left in Place."

Basis of Payment: Payment for this work will be made at the contract unit price per square foot for "Temporary Earth Retaining System" measured as described above, which price shall include all design, materials, equipment and labor incidental to the construction and removal of the temporary earth retaining system required at the locations specified on the plans; including removal of obstructions, repair and correction, adjustments or reconstruction required by the plans. Any common earth retaining system required for staged construction will be measured for payment only once.

Pay Item	Pay Unit
Temporary Earth Retaining System	s.f.

Rev. Date 05/21/08

7.17 Earth Retaining System Left in Place now in Jan. 2016 Supplements

ITEM #0715050A - EARTH RETAINING SYSTEM LEFT IN PLACE

Description: This specification covers only that portion of the temporary earth retaining syst that may be ordered left in place by the Engineer or designated in the plans to be left in place

Materials: Vacant

Construction Methods: The Contractor shall submit to the Engineer for approval, plans showing the proposed method of construction prior to the start of such construction.

Method of Measurement: Earth retaining system material left in place will be measured for payment by the square foot. This area will be measured or computed from the horizontal and vertical payment limits shown on the plans or as ordered. If no payment limits are shown on the plans, the limits used for payment will be the actual horizontal limit of temporary earth retaining system ordered or designated in the plans to be left in place, and the vertical limit will correspond to the method of measurement of the temporary earth retaining system.

Temporary earth retaining system left in place solely at the Contractor's option, and with the Engineer's permission, will not be measured for payment.

Basis of Payment: Payment for this work will be made as follows:

That portion of the temporary earth retaining system ordered or designated in the plans to be left in place will be paid for at the contract unit price per square foot for "Earth Retaining System Left in Place," applying to one or more structures or portions of structures, which price shall include only the cost of material left in place. All other expenses shall be paid for under the item for "Temporary Earth Retaining System."

Pay Item	Pay Unit
Earth Retaining System Left in Place	s.f.

ITEM #0822005A – TEMPORARY PRECAST CONCRETE BARRIER CURB (STRUCTURE)
ITEM #0822006A – RELOCATED TEMPORARY PRECAST CONCRETE BARRIER CURB (STRUCTURE)

Description: Work under this item shall consist of furnishing, installing, and removing temporary concrete barrier for use on structures as shown on the plans. This work shall also include furnishing and installing anchor bolts and the later removal of anchor bolts at the specific locations shown on the plans.

If called for on the plans, the temporary concrete barrier shall also be relocated as necessary to accommodate stage construction conditions.

Materials:

1. The barrier shall be precast concrete conforming to Article 8.21.02-1.

2. Manufacturer identification and casting date shall be permanently marked on each barrier unit by means of a non-corrosive metal or plastic tag in the location shown on the plan. When used barrier is furnished, the Contractor shall provide documentation stating from where the material came, what project it will be used on, the casting dates, and certification that the barrier conforms to all State requirements.

3. Reinforcing steel shall conform to the requirements of ASTM A615, Grade 60.

4. Lifting hooks, keys, bolts, devices and attachments shall be of the size indicated on the plans or of a design satisfactory for the purpose intended as approved by the Engineer.

5. Removable anchor bolts shall conform to ASTM A307. Heavy hex nuts shall conform to AASHTO M291. The plate washers shall conform to AASHTO M223, Grade 36. The anchor bolts, nuts, and plate washers shall be hot-dip galvanized in accordance with AASHTO M232 and M111 as applicable.

6. Loop bars shall be bent from smooth bar steel conforming to AISI 1018 (Hot-rolled). Ends shall be hot-dip galvanized in accordance with AASHTO M111.

7. Threaded connection rods shall be steel conforming to AASHTO M 314 (ASTM F1554) Grade 55 except that threads and nominal diameters shall conform to ANSI B1.13M for Class 6g threads. The rod shall be threaded for a minimum of 4 inches at each end. Plain steel washers shall be manufactured in accordance with ANSI B18.22M. Heavy hex nuts shall conform to AASHTO M 291M for Class 10S and shall conform to the geometry defined in ANSI B18.2.4.6M. The threaded connection rods, washers, and nuts shall be hot-dip galvanized after fabrication in accordance with the requirements of Class C of AASHTO M232.

8. The chemical anchor material shall be a resin compound specially formulated to secure bolts in concrete against tension pull-out. The Contractor shall select the chemical anchor material in accordance with Article M.03.01-15. s/b M.03.07 see supplements

9. Non-shrink grout shall conform to Subarticle M.03.01-12. s/b M.03.05 see supplements

10. Barrier shall be accepted on the basis of the manufacturer's certification, as defined in Article M.08.02-4.

11. Sealant for patching ~~holes in bituminous~~ overlays shall be a cold-applied bituminous sealer conforming to M.08.01-18. s/b M.08.01-15 see supplements

12. Anchor Bolts/Threaded Connection Rods-Certified Test Reports: The Contractor shall submit a Certified Test Report and a Materials Certificate in conformance with Article 1.06.07 and a sample of all anchor bolts, threaded connection rods, nuts, and washers for testing prior to their installation. The Contractor shall not install any anchor bolts or threaded connection rods prior to receipt of the approved test results and approval by the Engineer.

13. Delineators shall conform to Article 8.22.02.

Construction Methods:

1. Fabrication: The barrier shall be precast concrete in conformance with the pertinent requirements of Article 8.21.03 and the plans, except that penetrating sealer protective compound is not required.

2. Installation: The barrier shall be placed as shown on the plans or as directed by the Engineer.

   The barriers shall be anchored to the concrete deck or approach slab in accordance with the plans and the following:

   a) Prestressed Deck Units**:** Threaded inserts with matching anchor bolts shall be used for securing the barrier to prestressed deck units. The threaded inserts shall be cast into the deck units during fabrication as necessary to accommodate stage construction.

b) Chemical Anchoring: This consists of drilling holes in concrete deck or approach slabs, placing removable bolts in the holes, and securing the bolts with a pre-approved chemical anchor material.

The anchor bolts shall be treated with a resin coating which will enable their removal from the deck.

The Contractor shall submit the following to the Engineer for approval: type of drill, diameter of bit, method of cleaning holes, and method of placement of chemical anchor material. Also include specification and recommendation for the coating material from the chemical anchor material manufacturer. Drilling methods shall not cause spalling, cracking, or other damage to the concrete. Those areas damaged by the Contractor shall be repaired by him in a manner suitable to the Engineer and at no expense to the State.

When reinforcing steel is encountered during the drilling of the holes, the Contractor shall attempt to angle the hole to by-pass the bar. If this cannot be accomplished, then the bar shall be drilled through.

The anchor bolts shall extend to the bottom of the holes and be hammer tapped to insure full penetration. The chemical anchor material shall be installed in accordance with the written directions supplied by the manufacturer of the chemical anchor material.

The barrier shall be anchored down by torquing the bolts "snug tight", which is defined as the tightness attained after several impacts from an impact wrench. No part of the bolt head shall project above the outer surface of the barrier.

3. Connection of Barrier Units: The barrier shall be joined together with threaded connection rods, washers, and heavy hex nuts in accordance with the plans.

4. Cutting of Anchor Bolts: Where ordered by the Engineer, protruding anchor bolts shall be cut off flush with the surface of the concrete deck. The bolts shall then be ground down below the surface of the deck and the space filled in with non-shrink grout. At the Contractor's option, the anchor bolts may be pre-coated with a material recommended by the chemical anchoring material's manufacturer which will allow for complete removal of the anchor bolts.

5. Patching with Non-Shrink Grout: After removal of the barrier and threaded inserts, holes in newly constructed concrete decks or approach slabs shall be blown clean with an air jet and filled in with non-shrink grout. The non-shrink grout shall be mixed and placed in strict accordance with the manufacturer's directions. The non-shrink grout shall be finished flush with the deck surface. Allow grout to cure a

minimum of 24 hours before placing sealant in any remaining hole in the bituminous wearing surface.

6. Delineators: Delineators shall be installed on top of the barrier in accordance with Article 8.22.03-3 and the plans.

7. General: The barrier shall be kept in good condition at all times by the Contractor during all stages of construction. Any damaged material shall be replaced by the Contractor at his expense.

   When the barrier is no longer required, it shall be removed from the work site and become the property of the Contractor.

8. Relocation of Barrier: If called for on the plans, the Contractor shall relocate the barrier and its appurtenances to locations within the project limits as shown on the plans or as ordered by the Engineer.

Method of Measurement: Temporary structure barrier will be measured for payment along the centerline at the top of the barrier and will be the actual number of meters of temporary structure barrier furnished, installed, and accepted.

s/b linear feet

Relocated temporary structure barrier will be measured for payment along the centerline at the top of the barrier each time the barrier has been satisfactorily relocated and anchored as indicated on the plans, including to and from the storage area. Storage of the temporary structure barrier will not be measured for payment.

s/b linear foot

Basis of Payment: This work will be paid for at the contract unit price per meter for "Temporary Precast Concrete Barrier Curb (Structure)", complete in place, which price shall include all furnishing, transportation, storage, materials, including concrete, reinforcing steel, connection rods, and removable anchor bolts, drilling holes in the deck, initial installation, final removal, and hole patching, and which price shall also include hardware and incidental materials, equipment, tools, and labor incidental thereto. Each temporary structure barrier will be paid for once regardless of the number of times it is used on the project. Any temporary barrier units that become lost, damaged or defaced shall be replaced by the Contractor at no cost to the State.

s/b linear foot

The relocation of the temporary structure barrier will be paid for at the contract unit price per meter for "Relocated Temporary Precast Concrete Barrier Curb (Structure)", which price shall include removing, transporting and re-anchoring the barrier units, and all other materials, equipment, tool, and labor incidental thereto.

Delineators will be paid for in accordance with Article 12.05.05.

Pay Item - Pay Unit table missing

ITEM #0904949A -METAL BRIDGE RAIL (SOLID PANEL) (8' HIGH)

Description:

Work under this item shall consist of fabricating and installing metal bridge railings, consisting of extruded aluminum channels connected to aluminum posts, as shown on the plans, as directed by the Engineer and in accordance with this specification.

The Metal Bridge Rail system shall extend up to a point at least 8 feet above the riding surface at the curb line.

Materials:

Materials for this work shall conform to the following requirements:

1. Metal Bridge Rail:

Railing posts, post connection devices, splice bars and rails shall be extruded aluminum and conform to the requirements of ASTM B221, aluminum alloy 6061-T6.

Base plates for railing posts shall be made of aluminum plate and conform to the requirements of ASTM B209, aluminum alloy 6061-T6.

Bolts, nuts and washers shall be of aluminum alloy 2024-T4, 6061-T6, 6062-T9 and/or 7075-T6.

Stainless steel fasteners in contact with aluminum shall conform to the requirements of ASTM F593, Group 1 (AISI Type 304). Socket head cap screws shall be stainless steel and conform to the requirements of ASTM F837, Group 1 (ANSI Type 304). Washers shall be stainless steel and conform to the requirements of ASTM A167, Types 302 through 305.

2. Preset Anchorage:

The preset anchorage shall be fabricated as detailed on the contract plans. Preset anchorages configured differently from those detailed on the plans may be used provided they utilize the same materials described below and are approved by the Engineer prior to fabrication.

The wire struts shall be cold-drawn and conform to ASTM A510, Grade 1030 with minimum tensile strength of 100 ksi. These wire struts shall be securely welded to the ferrules with the welds capable of developing the tensile strength of the struts and the ferrules. Steel welding shall be in accordance with the American Welding Society "Structural Welding Code-Steel", AWS D1.1-2015.

The ferrules, either open end or closed end, shall conform to ASTM A108, Grade 12L14. A plastic cap shall be provided for sealing the bottom of each open end ferrule before placing concrete. Closed end ferrules shall provide a minimum full thread length of 2". Removable plastic washers of the same diameter as the

ferrules and approximately 3/32” in thickness shall be provided for the top of each ferrule and shall be left in place until the temporary supporting bolts are removed. Removable plastic caps shall be provided for sealing the top of each ferrule until the erection of railing posts.

After fabrication, the preset anchorage shall be hot-dip galvanized in accordance with ASTM A153. The bolts shall be "free running" in the ferrules after galvanization.

Bolts for the preset anchorage shall be stainless steel heavy hex head and shall conform to the requirements of ASTM F593, Group 1 (AISI Type 304). The manufacturer's symbol and the grade shall be clearly marked on the bolt heads. Nuts shall be stainless steel and conform to the requirements of ASTM F594, Group 1. Washers shall be stainless steel and conform to the requirements of ASTM A167, Types 302 through 305.

3. Molded Pads:

Molded pads shall be manufactured from new unvulcanized elastomer and unused synthetic fibers, with a weight proportion of fiber content equal to approximately one-half of the total weight of the pad. The pads shall be formed into single sheets of 1/8” minimum thickness, with a tolerance of plus or minus 10 percent. Pads shall have a Shore A Durometer hardness within the range of 70 to 90.

4. Submittals:

The Contractor shall furnish a Materials Certificate in conformance with the requirements of Article 1.06.07 for the following materials: Railing posts, post connection devices, splice bars, rails, base plates, preset anchorages, bolts, washers and molded pads.

A sample preset anchorage, and samples of all sizes of bolts and washers used with the metal bridge rail, shall be submitted to the Engineer for approval prior to incorporation into the project.

All submittals and shop drawings for the metal rail system will be reviewed by Amtrak and the Engineer.

Construction Methods:

Before fabricating any materials, the Contractor shall submit shop drawings to the Engineer for approval in accordance with Article 1.05.02. These drawings shall include but not be limited to the following information: A layout plan showing all railing support bracket spacings, expansion joint locations relative to parapet joints, elevation view detailing the vertical profiles and material designations.

Aluminum welding shall be in accordance with the American Welding Society "Structural Welding Code-Aluminum", AWS D1.2.

The preset anchorages shall be fabricated for installation of vertical posts. The anchorages shall be firmly and accurately held in position prior to and during the placing of concrete.

The railings shall be accurately fabricated and installed as shown on the plans. Lengths of channel rails shall extend between posts. Welding of two or more rails to form an element will not be allowed.

Posts shall be installed plumb and parallel to one another.

Accommodate the horizontal curvature of the bridge in the detailing of the posts and railings. Provide shims as needed for secure and accurate connections. Railings can be curved, if necessary by cold bending or by hot bending. Provide procedures for review and acceptance prior to cold or hot bending of any member.

Aluminum railings shall be carefully adjusted prior to fixing in place to ensure proper matching at abutting joints and correct alignment and curvature throughout their length. After installation, all rails and posts shall be free of burrs, sharp edges and irregularities.

Installation of the Metal Bridge Rail shall also be performed in accordance with the "Grounding and Bonding" special provisions.

Method of Measurement:

This work will be measured for payment by the actual number of linear feet of metal bridge rail completed and accepted, measured along the rail from end to end of channel.

Basis of Payment:

This work will be paid for at the contract unit price per linear foot for "Metal Bridge Rail (Solid Panel) (8' High)" complete and accepted in place, which price shall include all materials, equipment, tools, labor and work incidental thereto.

Pay Item - Pay Unit table missing

ITEM #0904902A – TEMPORARY PROTECTIVE FENCE (BRIDGE)

Description:

This bridge or barrier mounted temporary fence shall be at the locations shown on the plans and shall meet the requirements of Amtrak Section 01520A - "Requirements for Temporary Protection Shields for Demolition and Construction of Overhead Bridges and Other Structures".

See "NTC - Work on Railroad Property" for Amtrak requirements.

when available, we would like to review

Materials:

Materials shall conform to the requirements of Amtrak Section 01520A.

The length of the Temporary Protective Fence (Bridge) shall extend at least 25 feet beyond the centerlines of outside tracks (Track 1 and Track 4). It is anticipated that each length of Temporary Protective Fence (Bridge) will match the individual lengths of the permanent Metal Bridge Rail (Solid Panel).

Construction Methods:

The Contractor shall submit working drawings and design calculations for temporary protection shields in accordance with the requirements of Article 1.05.02(2) and Amtrak Section 01520A. The working drawings and design calculations shall be prepared, sealed and signed by a Professional Engineer, licensed in the state of Connecticut. The furnishing of such plans shall not serve to relieve the Contractor of any part of his responsibility for the safety of the work or for the successful completion of the project.

The Contractor shall fabricate, erect, maintain, remove and dispose of all bridge or barrier mounted temporary protective fence in accordance with Amtrak Section 01520A.

It is anticipated that the Temporary Protective Fence (Bridge) will be installed on Temporary Precast Barrier Curb (Structure). The Contractor shall develop details to mount to this barrier section.

Unless and until express permission is granted by Amtrak and the Engineer, the Temporary Protective Fence (Bridge) cannot be relocated between construction stages.

Method of Measurement:

This work will be measured for payment by the number of linear feet of completed and accepted structure mounted temporary protective fence (shield), measured from outside to outside of terminal posts.

Basis of Payment:

This work shall be paid for at the contract unit price per linear foot for "TEMPORARY PROTECTIVE FENCE (BRIDGE)," for the fabrication, installation, maintenance, removal and disposal of such fence, which price shall include all material, equipment, tools and labor incidental thereto.

Pay Item - Pay Unit table missing

ITEM #0969062A - CONSTRUCTION FIELD OFFICE, MEDIUM

Description: Under the item included in the bid document, adequate weatherproof office quarters with related furnishings, materials, equipment and other services, shall be provided by the Contractor for the duration of the work, and if necessary, for a close-out period determined by the Engineer. The office, furnishings, materials, equipment, and services are for the exclusive use of CTDOT forces and others who may be engaged to augment CTDOT forces with relation to the Contract. The office quarters shall be located convenient to the work site and installed in accordance with Article 1.08.02. This office shall be separated from any office occupied by the Contractor. Ownership and liability of the office quarters shall remain with the Contractor.

Furnishings/Materials/Supplies/Equipment: All furnishings, materials, equipment and supplies shall be in like new condition for the purpose intended and require approval of the Engineer.

Office Requirements: The Contractor shall furnish the office quarters and equipment as described below:

Description \ Office Size	Small	Med.	Large	Extra Large
Minimum Sq. Ft. of floor space with a minimum ceiling height of 7 ft.	400	400	1000	2000
Minimum number of exterior entrances.	2	2	2	2
Minimum number of parking spaces.	7	7	10	15

Office Layout: The office shall have a minimum square footage as indicated in the table above, and shall be partitioned as shown on the building floor plan as provided by the Engineer.

Tie-downs and Skirting: Modular offices shall be tied-down and fully skirted to ground level.

Lavatory Facilities: For field offices sizes Small and Medium the Contractor shall furnish a toilet facility at a location convenient to the field office for use by Department personnel and such assistants as they may engage; and for field offices sizes Large and Extra Large the Contractor shall furnish two (2) separate lavatories with toilet (men and women), in separately enclosed rooms that are properly ventilated and comply with applicable sanitary codes. Each lavatory shall have hot and cold running water and flush-type toilets. For all facilities the Contractor shall supply lavatory and sanitary supplies as required.

Windows and Entrances: The windows shall be of a type that will open and close conveniently, shall be sufficient in number and size to provide adequate light and ventilation, and shall be fitted with locking devices, blinds and screens. The entrances shall be secure, screened, and fitted with a lock for which four keys shall be furnished. All keys to the construction field office shall be furnished to the Department and will be kept in their possession while State personnel are using the office. Any access to the entrance ways shall meet applicable building codes, with appropriate handrails. Stairways shall be ADA/ABA compliant and have non-skid tread surfaces. An

ADA/ABA compliant ramp with non-skid surface shall be provided with the Extra-Large field office.

Lighting: The Contractor shall equip the office interior with electric lighting that provides a minimum illumination level of 100 foot-candles at desk level height, and electric outlets for each desk and drafting table. The Contractor shall also provide exterior lighting that provides a minimum illumination level of 2 foot-candles throughout the parking area and for a minimum distance of 10 ft. on each side of the field office.

Parking Facility: The Contractor shall provide a parking area, adjacent to the field office, of sufficient size to accommodate the number of vehicles indicated in the table above. If a paved parking area is not readily available, the Contractor shall construct a parking area and driveway consisting of a minimum of 6 inches of processed aggregate base graded to drain. The base material will be extended to the office entrance.

Field Office Security: Physical Barrier Devices - This shall consist of physical means to prevent entry, such as: 1) All windows shall be barred or security screens installed; 2) All field office doors shall be equipped with dead bolt locks and regular day operated door locks; and 3) Other devices as directed by the Engineer to suit existing conditions.

Electric Service: The field office shall be equipped with an electric service panel to serve the electrical requirements of the field office, including: lighting, general outlets, computer outlets, calculators etc., and meet the following minimum specifications:

A. 120/240 volt, 1 phase, 3 wire
B. Ampacity necessary to serve all equipment. Service shall be a minimum 100 amp dedicated to the construction field office.
C. The electrical panel shall include a main circuit breaker and branch circuit breakers of the size and quantity required.
D. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed at each computer workstation location.
E. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed, for use by the Telephone Company.
F. Additional 120-volt circuits and duplex outlets as required meeting National Electric Code requirements.
G. One exterior (outside) wall mounted GFI receptacle, duplex, isolated ground, 120 volt, straight blade.
H. After work is complete and prior to energizing, the State's CTDOT electrical inspector, must be contacted at 860-594-2240. (Do Not Call Local Town Officials)
I. Prior to field office removal, the CTDOT Office of Information Systems (CTDOT OIS) must be notified to deactivate the communications equipment.

Heating, Ventilation and Air Conditioning (HVAC): The field office shall be equipped with sufficient heating, air conditioning and ventilation equipment to maintain a temperature range of 68^{o}-80^{o} Fahrenheit within the field office.

Telephone Service: The Contractor shall provide telephone service with unlimited nation-wide calling plan. For a Small, Medium and Large field office this shall consist of the installation of two (2) telephone lines: one (1) line for phone/voice service and one (1) line dedicated for the facsimile machine. For an Extra-Large field office this shall consist of four (4) telephone lines: three (3) lines for phone/voice service and one (1) line dedicated for facsimile machine. The Contractor shall pay all charges.

Data Communications Facility Wiring: Contractor shall install a Category 6 568B patch panel in a central wiring location and Cat 6 cable from the patch panel to each PC station, Smart Board location, Multifunction Laser Printer/Copier/Scanner/Fax, terminating in a (Category 6 568B) wall or surface mount data jack. The central wiring location shall also house either the data circuit with appropriate power requirements or a category 5 cable run to the location of the installed data circuit. The central wiring location will be determined by the CTDOT OIS staff in coordination with the designated field office personnel as soon as the facility is in place.

For Small, Medium and Large field offices the Contractor shall run a CAT 6 LAN cable a minimum length of 25 feet for each computer to LAN switch area leaving an additional 10 feet of cable length on each side with terminated RJ45 connectors. For an Extra-Large field office the Contractor shall run CAT 6 LAN cables from workstations, install patch panel in data circuit demark area and terminate runs with RJ45 jacks at each computer location. Terminate runs to patch panel in LAN switch area. Each run / jack shall be clearly labeled with an identifying Jack Number.

The Contractor shall supply cables to connect the Wi-Fi printer to the Contractor supplied internet router and to workstations as needed. These cables shall be separate from the LAN cables and data Jacks detailed above for the Department network.

The installation of a data communication circuit between the field office and the CTDOT OIS in Newington will be coordinated between the CTDOT District staff, CTDOT OIS staff and the local utility company once the Contractor supplies the field office phone numbers and anticipated installation date. The Contractor shall provide the field office telephone number(s) to the CTDOT Project Engineer within 10 calendar days after the signing of the Contract as required by Article 1.08.02. This is required to facilitate data line and computer installations.

Additional Equipment, Facilities and Services: The Contractor shall provide at the field Office at least the following to the satisfaction of the Engineer:

Furnishing Description	Office Size

	Small	Med.	Large	Extra Large
	Quantity			
Office desk (2.5 ft x 5 ft) with drawers, locks, and matching desk chair that have pneumatic seat height adjustment and dual wheel casters on the base.	1	3	5	8
Standard secretarial type desk and matching desk chair that has pneumatic seat height adjustment and dual wheel casters on the base.	-	-	-	1
Personal computer tables (4 ft x 2.5 ft).	2	3	5	8
Drafting type tables (3 ft x 6 ft) and supported by wall brackets and legs; and matching drafters stool that have pneumatic seat height adjustment, seat back and dual wheel casters on the base.	1	1	1	2
Conference table, 3 ft x 12 ft.	-	-	-	1
Table – 3 ft x 6 ft.	-	-	-	1
Office Chairs.	2	4	8	20
Mail slot bin – legal size.	-	-	1	1
Non-fire resistant cabinet.	-	-	2	4
Fire resistant cabinet (legal size/4 drawer), locking.	1	1	2	3
Storage racks to hold 3 ft x 5 ft display charts.	-	-	1	2
Vertical plan racks for 2 sets of 2 ft x 3 ft plans for each rack.	1	1	2	2
Double door supply cabinet with 4 shelves and a lock – 6 ft x 4 ft.	-	-	1	2
Case of cardboard banker boxes (Min 10 boxes/case)	1	1	2	3
Open bookcase – 3 shelves – 3 ft long.	-	-	2	2
White Dry-Erase Board, 36” x 48”min. with markers and eraser.	1	1	1	1
Interior partitions – 6 ft x 6 ft, soundproof type, portable and freestanding.	-	-	6	6
Coat rack with 20 coat capacity.	-	-	-	1
Wastebaskets - 30 gal., including plastic waste bags.	1	1	1	2
Wastebaskets - 5 gal., including plastic waste bags.	1	3	6	10
Electric wall clock.	-	-	-	2
Telephone.	1	1	1	-
Full size stapler 20 (sheet capacity, with staples)	1	2	5	8
Desktop tape dispensers (with Tape)	1	2	5	8
Rain Gauge	1	1	1	1
Business telephone system for three lines with ten handsets, intercom capability, and one speaker phone for conference table.	-	-	-	1
Mini refrigerator - 3.2 c.f. min.	1	1	1	1
Hot and cold water dispensing unit. Disposable cups and	1	1	1	1

bottled water shall be supplied by the Contractor for the duration of the project.				
Microwave, 1.2 c.f. , 1000W min.	1	1	1	1
Fire extinguishers - provide and install type and *number to meet applicable State and local codes for size of office indicated, including a fire extinguisher suitable for use on a computer terminal fire.	*	*	*	*
Electric pencil sharpeners.	1	2	2	2
Electronic office type printing calculators capable of addition, subtraction, multiplication and division with memory and a supply of printing paper.	1	1	2	4
Small Multi-Function Laser Printer/Copier/Scanner/Fax combination unit, network capable, as specified below under Computer Hardware and Software.	1	1		
Large Multi-Function Laser Printer/Copier/Scanner/Fax combination unit, network capable, as specified below under Computer Hardware and Software.			1	1
Field Office Wi-Fi Connection as specified below under Computer Hardware and Software	1	1	1	1
Wi-Fi Printer as specified below under Computer Hardware and Software.	1	1	1	1
Digital Camera as specified below under Computer Hardware and Software.	1	1	3	3
Video Projector as specified below under Computer Hardware and Software.	-	-	-	1
Smart Board as specified below under Computer Hardware and Software.	-	-	-	1
Infrared Thermometer, including annual third party certified calibration, case, and cleaning wipes.	1	1	1	2
Concrete Curing Box as specified below under Concrete Testing Equipment.	1	1	1	1
Concrete Air Meter and accessories as specified below under Concrete Testing Equipment as specified below. Contractor shall provide third party calibration on a quarterly basis.	1	1	1	1
Concrete Slump Cone and accessories as specified below under Concrete Testing Equipment.	1	1	1	1
First Aid Kit	1	1	1	1

Flip Phones as specified under Computer Hardware and Software.	-	-	-	-
Smart Phones as specified under Computer Hardware and Software.	-	-	-	-

The furnishings and equipment required herein shall remain the property of the Contractor. Any supplies required to maintain or operate the above listed equipment or furnishings shall be provided by the Contractor for the duration of the project.

Computer Hardware and Software: Field Office Wi-Fi Connection, Wi-Fi Printer, Digital Camera(s), Flip Phones, Smart Phones, Multifunction Laser Printer/Copier/Scanner/Fax, Video Projectors, and Smart Board(s) as well as associated hardware and software, must meet the requirements of this specification as well as the latest minimum specifications posted, as of the project advertising date, at Departments web site http://www.ct.gov/dot/cwp/view.asp?a=1410&q=563904

Within 10 calendar days after the signing of the Contract but before ordering/purchasing the Wi-Fi Printer (separate from the Multifunction Laser Printer/Copier/Scanner/Fax), Field Office Wi-Fi, Digital Camera(s), Flip Phones, Smart Phones, Multifunction Laser Printer/Copier/Scanner/Fax, Video Projector(s) and Smart Board(s) as well as associated hardware, the Contractor must submit a copy of their proposed order(s) with catalog cuts and specifications to the Administering CTDOT District for review and approval. The Wi-Fi Printer, Wi-Fi Router, Flip Phones, Smart Phones, digital cameras, Projector(s) and Smart Board(s) will be reviewed by CTDOT District personnel. The Multifunction Laser Printer/Copier/Scanner/Fax will be reviewed by the CTDOT OIS. The Contractor shall not purchase the hardware, software, or services until the Administering CTDOT District informs them that the proposed equipment, software, and services are approved. The Contractor will be solely responsible for the costs of any hardware, software, or services purchased without approval.

The Contractor and/or their internet service provider shall be responsible for the installation and setup of the field office Wi-Fi, Wi-Fi printer, and the configuration of the wireless router as directed by the Department. Installation will be coordinated with CTDOT District and Project personnel.

After the approval of the hardware and software, the Contractor shall contact the designated representatives of the CTDOT administering District, a minimum of 2 working days in advance of the proposed delivery or installation of the Field Office Wi-Fi Connection, Wi-Fi Printer, Digital Camera(s), Flip Phones, Smart Phones, Multifunction Laser Printer/Copier/Scanner/Fax, Video Projectors and Smart Board(s), as well as associated hardware, software, supplies, and support documentation.

The Contractor shall provide all supplies, paper, maintenance, service and repairs (including labor and parts) for the Wi-Fi printers, copiers, field office Wi-Fi, fax machines and other equipment and facilities required by this specification for the duration of the Contract. All repairs must be performed with-in 48 hours. If the repairs require more than a 48 hours then an equal or better replacement must be provided.

Once the Contract has been completed, the hardware and software will remain the property of the Contractor.

First Aid Kit: The Contractor shall supply a first aid kit adequate for the number of personnel expected based on the size of the field office specified and shall keep the first aid kit stocked for the duration that the field office is in service.

Rain Gauge: The Contractor shall supply install and maintain a rain gauge for the duration of the project, meeting these minimum requirements. The rain gauge shall be installed on the top of a post such that the opening of the rain gauge is above the top of the post an adequate distance to avoid splashing of rain water from the top of the post into the rain gauge. The Location of the rain gauge and post shall be approved by the Engineer. The rain gauge shall be made of a durable material and have graduations of 0.1 inches or less with a minimum total column height of 5 inches. If the rain gauge is damaged the Contractor shall replace it prior to the next forecasted storm event at no additional cost.

Concrete Testing Equipment: If the Contract includes items that require compressive strength cylinders for concrete, in accordance with the Schedule of Minimum Testing Requirements for Sampling Materials for Test, the Contractor shall provide the following equipment.

A) Concrete Cylinder Curing Box – meeting the requirements of Section 6.12 of the Standard Specifications.

B) Air Meter – The air meter provided shall be in good working order and meet the requirements of AASHTO T 152.

C) Slump Cone Mold – Slump cone, base plate, and tamping rod shall be provided in like-new condition and meet the requirements of AASHTO T119, Standard Test Method for Slump of Hydraulic-Cement Concrete.

All testing equipment will remain the property of the Contractor at the completion of the project.

Insurance Policy: The Contractor shall provide a separate insurance policy, with no deductible, in the minimum amount of five thousand dollars ($5,000) in order to insure all State-owned data equipment and supplies used in the office against all losses. The Contractor shall be named insured on that policy, and the Department shall be an additional named insured on the policy. These losses shall include, but not be limited to: theft, fire, and physical damage. The Department will be responsible for all maintenance costs of Department owned computer hardware. In the event of loss, the Contractor shall provide replacement equipment in accordance with current Department equipment specifications, within seven days of notice of the loss. If the Contractor is unable to provide the required replacement equipment within seven days, the Department may provide replacement equipment and deduct the cost of the equipment from monies due or which may become due the Contractor under the Contract or under any other contract. The Contractor's financial liability under this paragraph shall be limited to the amount of the insurance coverage required by this paragraph. If the cost of equipment replacement required by this paragraph should

exceed the required amount of the insurance coverage, the Department will reimburse the Contractor for replacement costs exceeding the amount of the required coverage.

Maintenance: During the occupancy by the Department, the Contractor shall maintain all facilities and furnishings provided under the above requirements, and shall maintain and keep the office quarters clean through the use of weekly professional cleaning to include, but not limited to, washing & waxing floors, cleaning restrooms, removal of trash, etc. Exterior areas shall be mowed and clean of debris. A trash receptacle (dumpster) with weekly pickup (trash removal) shall be provided. Snow removal, sanding and salting of all parking, walkway, and entrance ways areas shall be accomplished during a storm if on a workday during work hours, immediately after a storm and prior to the start of a workday. If snow removal, salting and sanding are not completed by the specified time, the State will provide the service and all costs incurred will be deducted from the next payment estimate.

Method of Measurement: The furnishing and maintenance of the construction field office will be measured for payment by the number of calendar months that the office is in place and in operation, rounded up to the nearest month.

There will not be any price adjustment due to any change in the minimum computer hardware and software requirements.

Basis of Payment: The furnishing and maintenance of the Construction Field Office will be paid for at the Contract unit price per month for "Construction Field Office, (Type)," which price shall include all material, equipment, labor, service contracts, licenses, software, repair or replacement of hardware and software, related supplies, utility services, parking area, external illumination, trash removal, snow and ice removal, and work incidental thereto, as well as any other costs to provide requirements of this specified this specification.

Pay Item	Pay Unit
Construction Field Office, (Type)	Month

Rev. Date 1/2008

revised Owned Spec. Provision and added into Jan. 2016 Supplements

ITEM #0970006A - TRAFFICPERSON (MUNICIPAL POLICE OFFICI
ITEM #0970007A - TRAFFICPERSON (UNIFORMED FLAGGER)

9.70.01—Description: Under this item the Contractor shall provide the servic Trafficpersons of the type and number, and for such periods, as the Engineer approves control and direction of vehicular traffic and pedestrians. Traffic persons requested solely contractor's operational needs will not be approved for payment.

9.70.03—Construction Method: Prior to the start of operations on the project requiring the use of Trafficpersons, a meeting will be held with the Contractor, Trafficperson agency or firm, Engineer, and State Police, if applicable, to review the Trafficperson operations, lines of responsibility, and operating guidelines which will be used on the project. A copy of the municipality's billing rates for Municipal Police Officers and vehicles, if applicable, will be provided to the Engineer prior to start of work.

On a weekly basis, the Contractor shall inform the Engineer of their scheduled operations for the following week and the number of Trafficpersons requested. The Engineer shall review this schedule and approve the type and number of Trafficpersons required. In the event of an unplanned, emergency, or short term operation, the Engineer may approve the temporary use of properly clothed persons for traffic control until such time as an authorized Trafficperson may be obtained. In no case shall this temporary use exceed 8 hours for any particular operation.

If the Contractor changes or cancels any scheduled operations without prior notice of same as required by the agency providing the Trafficpersons, and such that Trafficperson services are no longer required, the Contractor will be responsible for payment at no cost to the Department of any show-up cost for any Trafficperson not used because of the change. Exceptions, as approved by the Engineer, may be granted for adverse weather conditions and unforeseeable causes beyond the control and without the fault or negligence of the Contractor.

Trafficpersons assigned to a work site are to only take direction from the Engineer.

Trafficpersons shall wear a high visibility safety garment that complies with OSHA, MUTCD, ASTM Standards and the safety garment shall have the words "Traffic Control" clearly visible on the front and rear panels (minimum letter size 2 inches (50 millimeters). Worn/faded safety garments that are no longer highly visible shall not be used. The Engineer shall direct the replacement of any worn/faded garment at no cost to the State.

A Trafficperson shall assist in implementing the traffic control specified in the Maintenance and Protection of Traffic contained elsewhere in these specifications or as directed by the Engineer. Any situation requiring a Trafficperson to operate in a manner contrary to the Maintenance and Protection of Traffic specification shall be authorized in writing by the Engineer.

Trafficpersons shall consist of the following types:

1. Uniformed Law Enforcement Personnel: Law enforcement personnel shall wear the high visibility safety garment provided by their law enforcement agency. If no high visibility safety garment is provided, the Contractor shall provide the law enforcement personnel with a garment meeting the requirements stated for the Uniformed Flaggers' garment.

Law Enforcement Personnel may be also be used to conduct motor vehicle enforcement operations in and around work areas as directed and approved by the Engineer.

Municipal Police Officers: Uniformed Municipal Police Officers shall be sworn Municipal Police Officers or Uniformed Constables who perform criminal law enforcement duties from the Municipality in which the project is located. Their services will also include an official Municipal Police vehicle when requested by the Engineer. Uniformed Municipal Police Officers will be used on non-limited access highways. If Uniformed Municipal Police Officers are unavailable, other Trafficpersons may be used when authorized in writing by the Engineer.
Uniformed Municipal Police Officers and requested Municipal Police vehicles will be used at such locations and for such periods as the Engineer deems necessary to control traffic operations and promote increased safety to motorists through the construction sites.

2. Uniformed Flagger: Uniformed Flaggers shall be persons who have successfully completed flagger training by the American Traffic Safety Services Association (ATSSA), National Safety Council (NSC) or other programs approved by the Engineer. A copy of the Flagger's training certificate shall be provided to the Engineer before the Flagger performs any work on the project. Uniformed Flaggers shall conform to Chapter 6E, Flagger Control, in the Manual of Uniformed Traffic Control Devices (MUTCD) and shall wear high-visibility safety apparel, use a STOP/SLOW paddle that is at least 18 inches (450 millimeters) in width with letters at least 6 inches (150 millimeters) high. The paddle shall be mounted on a pole of sufficient length to be 6 feet (1.8 meters) above the ground as measured from the bottom of the sign.

Uniformed Flaggers will only be used on non-limited access highways to control traffic operations when authorized in writing by the Engineer.

9.70.04—Method of Measurement: Services of Trafficpersons will be measured for payment by the actual number of hours for each person rendering services approved by the Engineer. These services shall include, however, only such trafficpersons as are employed within the limits of construction, project right of way of the project or along detours authorized by the Engineer to assist the motoring public through the construction work zone. Services for continued use of a detour or bypass beyond the limitations approved by the Engineer, for movement of construction vehicles and equipment, or at locations where traffic is unnecessarily restricted by the Contractor's method of operation, will not be measured for payment.

Trafficpersons shall not work more than twelve hours in any one 24 hour period. In case such services are required for more than twelve hours, additional Trafficpersons shall be furnished and measured for payment. In cases where the Trafficperson is an employee on the Contractor's payroll, payment under the item "Trafficperson (Uniformed Flagger)" will be made only for those hours when the Contractor's employee is performing Trafficperson services.

Travel time will not be measured for payment for services provided by Uniformed Municipal Police Officers or Uniformed Flaggers.

Mileage fees associated with Trafficperson services will not be measured for payment.

Safety garments and STOP/SLOW paddles will not be measured for payment.

9.70.05—Basis of Payment: Trafficpersons will be paid in accordance with the schedule described herein.
There will be no direct payment for safety garments or STOP/SLOW paddles. All costs associated with furnishing safety garments and STOP/SLOW paddles shall be considered included in the general cost of the item.

1. Uniformed Law Enforcement Personnel: The sum of money shown on the Estimate and in the itemized proposal as "Estimated Cost" for this work will be considered the bid price even though payment will be made as described below. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used to determine the total amount for the contract.

The Department will pay the Contractor its actual costs for "Trafficperson (Municipal Police Officer)" plus an additional 5% as reimbursement for the Contractor's administrative expense in connection with the services provided.

The invoice must include a breakdown of each officer's actual hours of work and actual rate applied. Mileage fees associated with Trafficperson services are not reimbursable expenses and are not to be included in the billing invoice. The use of a municipal police vehicle authorized by the Engineer will be paid at the actual rate charged by the municipality. Upon receipt of the invoice from the municipality, the Contractor shall forward a copy to the Engineer. The invoice will be reviewed and approved by the Engineer prior to any payments. *Eighty (80%) of the invoice will be paid upon completion of review and approval. The balance (20%) will be paid upon receipt of cancelled check or receipted invoice, as proof of payment.* The rate charged by the municipality for use of a uniformed municipal police officer and/or a municipal police vehicle shall not be greater than the rate it normally charges others for similar services.

2. Uniformed Flagger: Uniformed flaggers will be paid for at the contract unit price per hour for "Trafficperson (Uniformed Flagger)", which price shall include all compensation, insurance benefits and any other cost or liability incidental to the furnishing of the trafficpersons ordered.

Pay Item	Pay Unit
Trafficperson (Municipal Police Officer)	est.
Trafficperson (Uniformed Flagger)	Hr.

ITEM NO. 0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

Article 9.71.01 – Description is supplemented by the following:

The Contractor shall maintain and protect traffic as described by the following and as limited in the Special Provision "Prosecution and Progress":

Route 349 (Clarence B. Sharp Hwy.)

The Contractor shall maintain and protect one lane of through traffic in each direction, on a paved travelpath of not less than 12 feet in width.

When necessary for construction operation purposes and with prior approval from the Engineer, the Contractor will be allowed to halt Route 349 for a period not to exceed 10 minutes to perform work necessary. If more than one 10-minute period is required, the Contractor shall allow all stored vehicles to proceed through the work area prior to the next stoppage.

Ramps and Turning Roadways (Bridge Nos. 03330 and 03331)

The Contractor shall maintain and protect existing traffic operations.

During construction work on Bridge No. 03330 (southbound off-ramp) and Bridge No. 03331 (northbound on-ramp), existing traffic operations on the Route 349 will be considered to be as shown on the Maintenance and Protection of Traffic plans contained in the project contract.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor will be allowed to maintain and protect a minimum of one lane of traffic on a paved travelpath not less than 12 feet in width.

When necessary for the erection and removal of bridge scaffolding and with prior approval from the Engineer, the Contractor will be allowed to halt ramp and turning roadway traffic for a period not to exceed 10 minutes to perform the work necessary for the erection and removal of the bridge scaffolding. If more than one 10-minute period is required, the Contractor shall allow all stored vehicles to proceed through the work area prior to the next stoppage.

US Route 1 (Long Hill Rd.), Bridge St., Broad St., North St. Meridian St. and Meridian St. Ext.

The Contractor shall maintain and protect one lane of through traffic in each direction, on a paved travelpath not less than 11 feet in width.

All Other Roadways

The Contractor shall maintain and protect a minimum of one lane of traffic in each direction, each lane on a paved travel path not less than 11 feet in width.

Commercial and Residential Driveways

The Contractor shall maintain access to and egress from all commercial and residential driveways throughout the project limits. The Contractor will be allowed to close said driveways to perform the required work during those periods when the businesses are closed, unless permission is granted from the business owner to close the driveway during business hours. If a temporary closure of a residential driveway is necessary, the Contractor shall coordinate with the owner to determine the time period of the closure.

Article 9.71.03 - Construction Methods is supplemented as follows:

General

Unpaved travel paths will only be permitted for areas requiring full depth and full width reconstruction, in which case, the Contractor will be allowed to maintain traffic on processed aggregate for a duration not to exceed 10 calendar days. The unpaved section shall be the full width of the road and perpendicular to the travel lanes. Opposing traffic lane dividers shall be used as a centerline.

The Contractor is required to delineate any raised structures within the travel lanes, so that the structures are visible day and night, unless there are specific contract plans and provisions to temporarily lower these structures prior to the completion of work.

The Contractor shall schedule operations so that pavement removal and roadway resurfacing shall be completed full width across a roadway (bridge) section by the end of a workday (work night), or as directed by the Engineer.

When the installation of all intermediate courses of bituminous concrete pavement is completed for the entire roadway, the Contractor shall install the final course of bituminous concrete pavement.

When the Contractor is excavating adjacent to the roadway, the Contractor shall provide a 3-foot shoulder between the work area and travel lanes, with traffic drums spaced every 50 feet. At the end of the workday, if the vertical drop-off exceeds 3 inches, the Contractor shall provide a temporary traversable slope of 4:1 or flatter that is acceptable to the Engineer.

The Contractor, during the course of active construction work on overhead signs and structures, shall close the lanes directly below the work area for the entire length of time overhead work is being undertaken. At no time shall an overhead sign be left partially removed or installed.

If applicable, when an existing sign is removed, it shall be either relocated or replaced by a new sign during the same working day.

The Contractor shall not store any material on-site which would present a safety hazard to motorists or pedestrians (e.g. fixed object or obstruct sight lines).

The field installation of a signing pattern shall constitute interference with existing traffic operations and shall not be allowed, except during the allowable periods.

Construction vehicles entering travel lanes at speeds less than the posted speed are interfering with traffic, and shall not be allowed without a lane closure. The lane closure shall be of sufficient length to allow vehicles to enter or exit the work area at posted speeds, in order to merge with existing traffic.

Existing Signing

The Contractor shall maintain all existing overhead and side-mounted signs throughout the project limits during the duration of the project. The Contractor shall temporarily relocate signs and sign supports as many times as deemed necessary and install temporary sign supports if necessary as directed by the Engineer. During work on the NB Bridge, the Contractor shall temporarily cover the "Exit Only" portion of the overhead sign located at Sta. 17+57.

Requirements for Winter

The Contractor shall schedule a meeting with representatives from the Department including the offices of Maintenance and Traffic, and the Town/City to determine what interim traffic control measures the Contractor shall accomplish for the winter to provide safety to the motorists and permit adequate snow removal procedures. This meeting shall be held prior to October 31 of each year and will include, but not be limited to, discussion of the status and schedule of the following items: lane and shoulder widths, pavement restoration, traffic signal work, pavement markings, and signing.

Signing Patterns

The Contractor shall erect and maintain all signing patterns in accordance with the traffic control plans contained herein. Proper distances between advance warning signs and proper taper lengths are mandatory.

Article 9.71.05 – Basis of Payment is supplemented by the following:

The temporary relocation of signs and supports, and the furnishing, installation and removal of any temporary supports shall be paid for under the item “Maintenance and Protection of Traffic”. Temporary overhead sign supports and foundations shall be paid for under the appropriate item(s).

The cost of furnishing, installing, and removing the material for the 4H:1V traversable slope shall be paid for under the item “Maintenance and Protection of Traffic.”

Pavement Markings - Limited Access Highways, Turning Roadways and Ramps

During construction, the Contractor shall maintain all pavement markings throughout the limits of the project.

Interim Pavement Markings

The Contractor shall install painted pavement markings, which shall include lane lines (broken lines), shoulder edge lines, stop bars, lane-use arrows and gore markings, on each intermediate course of bituminous concrete pavement and on any milled surface by the end of the work day/night. All painted pavement markings will be paid under the appropriate items.

If the Contractor does not install permanent Epoxy Resin Pavement Markings by the end of the work day/night on exit ramps where the final course of bituminous concrete pavement has been installed, the Contractor shall install temporary 12 inch wide white stop bars. The temporary stop bars shall consist of Temporary Plastic Pavement Marking Tape and shall be installed by the end of the work day/night. Stop bars may consist of two 6 inch wide white markings or three 4 inch wide white markings placed side by side. The Contractor shall remove and dispose of these markings when the permanent Epoxy Resin Pavement Markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

If an intermediate course of bituminous concrete pavement will be exposed throughout the winter, then Epoxy Resin Pavement Markings should be installed unless directed otherwise by the Engineer.

Final Pavement Markings

The Contractor should install painted pavement markings on the final course of bituminous concrete pavement by the end of the work day/night. If the painted pavement markings are not installed by the end of the work day/night, then Temporary Plastic Pavement Marking Tape shall be installed as described above and the painted pavement markings shall be installed by the end of the work day/night on Friday of that week.

If Temporary Plastic Pavement Marking Tape is installed, the Contractor shall remove and dispose of these markings when the painted pavement markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

The Contractor shall install permanent Epoxy Resin Pavement Markings in accordance with Section 12.10 entitled "Epoxy Resin Pavement Markings, Symbols, and Legends" after such time as determined by the Engineer.

TRAFFIC CONTROL DURING CONSTRUCTION OPERATIONS

The following guidelines shall assist field personnel in determining when and what type of traffic control patterns to use for various situations. These guidelines shall provide for the safe and efficient movement of traffic through work zones and enhance the safety of work forces in the work area.

TRAFFIC CONTROL PATTERNS

Traffic control patterns shall be used when a work operation requires that all or part of any vehicle or work area protrudes onto any part of a travel lane or shoulder. For each situation, the installation of traffic control devices shall be based on the following:

Speed and volume of traffic
Duration of operation
Exposure to hazards

Traffic control patterns shall be uniform, neat and orderly so as to command respect from the motorist.

In the case of a horizontal or vertical sight restriction in advance of the work area, the traffic control pattern shall be extended to provide adequate sight distance for approaching traffic.

If a lane reduction taper is required to shift traffic, the entire length of the taper should be installed on a tangent section of roadway so that the entire taper area can be seen by the motorist.

Any existing signs that are in conflict with the traffic control patterns shall be removed, covered, or turned so that they are not readable by oncoming traffic.

When installing a traffic control pattern, a Buffer Area should be provided and this area shall be free of equipment, workers, materials and parked vehicles.

Typical traffic control plans 19 through 25 may be used for moving operations such as line striping, pot hole patching, mowing, or sweeping when it is necessary for equipment to occupy a travel lane.

Traffic control patterns will not be required when vehicles are on an emergency patrol type activity or when a short duration stop is made and the equipment can be contained within the shoulder. Flashing lights and appropriate trafficperson shall be used when required.

Although each situation must be dealt with individually, conformity with the typical traffic control plans contained herein is required. In a situation not adequately covered by the typical traffic control plans, the Contractor must contact the Engineer for assistance prior to setting up a traffic control pattern.

PLACEMENT OF SIGNS

Signs must be placed in such a position to allow motorists the opportunity to reduce their speed prior to the work area. Signs shall be installed on the same side of the roadway as the work area. On multi-lane divided highways, advance warning signs shall be installed on both sides of the highway. On directional roadways (on-ramps, off-ramps, one-way roads), where the sight distance to signs is restricted, these signs should be installed on both sides of the roadway.

ALLOWABLE ADJUSTMENT OF SIGNS AND DEVICES SHOWN ON THE TRAFFIC CONTROL PLANS

The traffic control plans contained herein show the location and spacing of signs and devices under ideal conditions. Signs and devices should be installed as shown on these plans whenever possible.

The proper application of the traffic control plans and installation of traffic control devices depends on actual field conditions.

Adjustments to the traffic control plans shall be made only at the direction of the Engineer to improve the visibility of the signs and devices and to better control traffic operations. Adjustments to the traffic control plans shall be based on safety of work forces and motorists, abutting property requirements, driveways, side roads, and the vertical and horizontal curvature of the roadway.

The Engineer may require that the traffic control pattern be located significantly in advance of the work area to provide better sight line to the signing and safer traffic operations through the work zone.

Table I indicates the minimum taper length required for a lane closure based on the posted speed limit of the roadway. These taper lengths shall only be used when the recommended taper lengths shown on the traffic control plans cannot be achieved.

TABLE I – MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT MILES PER HOUR	MINIMUM TAPER LENGTH IN FEET FOR A SINGLE LANE CLOSURE
30 OR LESS	180
35	250
40	320
45	540
50	600
55	660
65	780

SECTION 1. WORK ZONE SAFETY MEETINGS

1.a) Prior to the commencement of work, a work zone safety meeting will be conducted with representatives of DOT Construction, Connecticut State Police (Local Barracks), Municipal Police, the Contractor (Project Superintendent) and the Traffic Control Subcontractor (if different than the prime Contractor) to review the traffic operations, lines of responsibility, and operating guidelines which will be used on the project. Other work zone safety meetings during the course of the project should be scheduled as needed.

1.b) A Work Zone Safety Meeting Agenda shall be developed and used at the meeting to outline the anticipated traffic control issues during the construction of this project. Any issues that can't be resolved at these meetings will be brought to the attention of the District Engineer and the Office of Construction. The agenda should include:

- Review Project scope of work and time
- Review Section 1.08, Prosecution and Progress
- Review Section 9.70, Trafficpersons
- Review Section 9.71, Maintenance and Protection of Traffic
- Review Contractor's schedule and method of operations.
- Review areas of special concern: ramps, turning roadways, medians, lane drops, etc.
- Open discussion of work zone questions and issues
- Discussion of review and approval process for changes in contract requirements as they relate to work zone areas

SECTION 2. GENERAL

2.a) If the required minimum number of signs and equipment (i.e. one High Mounted Internally Illuminated Flashing Arrow for each lane closed, two TMAs, Changeable Message Sign, etc.) are not available; the traffic control pattern shall not be installed.

2.b) The Contractor shall have back-up equipment (TMAs, High Mounted Internally Illuminated Flashing Arrow, Changeable Message Sign, construction signs, cones/drums, etc.) available at all times in case of mechanical failures, etc. The only exception to this is in the case of sudden equipment breakdowns in which the pattern may be installed but the Contractor must provide replacement equipment within 24 hours.

2.c) Failure of the Contractor to have the required minimum number of signs, personnel and equipment, which results in the pattern not being installed, shall not be a reason for a time extension or claim for loss time.

2.d) In cases of legitimate differences of opinion between the Contractor and the Inspection staff, the Inspection staff shall err on the side of safety. The matter shall be brought to

the District Office for resolution immediately or, in the case of work after regular business hours, on the next business day.

SECTION 3. INSTALLING AND REMOVING TRAFFIC CONTROL PATTERNS

3.a) Lane Closures shall be installed beginning with the advance warning signs and proceeding forward toward the work area.

3.b) Lane Closures shall be removed in the reverse order, beginning at the work area, or end of the traffic control pattern, and proceeding back toward the advance warning signs.

3.c) Stopping traffic may be allowed:

- As per the contract for such activities as blasting, steel erection, etc.
- During paving, milling operations, etc. where, in the middle of the operation, it is necessary to flip the pattern to complete the operation on the other half of the roadway and traffic should not travel across the longitudinal joint or difference in roadway elevation.
- To move slow moving equipment across live traffic lanes into the work area.

3.d) Under certain situations when the safety of the traveling public and/or that of the workers may be compromised due to conditions such as traffic volume, speed, roadside obstructions, or sight line deficiencies, as determined by the Engineer and/or State Police, traffic may be briefly impeded while installing and/or removing the advance warning signs and the first ten traffic cones/drums only. Appropriate measures shall be taken to safely slow traffic. If required, traffic slowing techniques may be used and shall include the use of Truck Mounted Impact Attenuators (TMAs) as appropriate, for a minimum of one mile in advance of the pattern starting point. Once the advance warning signs and the first ten traffic cones/drums are installed/removed, the TMAs and sign crew shall continue to install/remove the pattern as described in Section 5 and traffic shall be allowed to resume their normal travel.

3.e) The Contractor must adhere to using the proper signs, placing the signs correctly, and ensuring the proper spacing of signs.

3.f) Additional devices are required on entrance ramps, exit ramps, and intersecting roads to warn and/or move traffic into the proper travelpath prior to merging/exiting with/from the main line traffic. This shall be completed before installing the mainline pattern past the ramp or intersecting roadway.

3.g) Prior to installing a pattern, any conflicting existing signs shall be covered with an opaque material. Once the pattern is removed, the existing signs shall be uncovered.

3.h) On limited access roadways, workers are prohibited from crossing the travel lanes to install and remove signs or other devices on the opposite side of the roadway. Any signs or devices on the opposite side of the roadway shall be installed and removed separately.

SECTION 4. USE OF HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

4.a) On limited access roadways, one Flashing Arrow shall be used for each lane that is closed. The Flashing Arrow shall be installed concurrently with the installation of the traffic control pattern and its placement shall be as shown on the traffic control plan. For multiple lane closures, one Flashing Arrow is required for each lane closed. If conditions warrant, additional Flashing Arrows should be employed (i.e.: curves, major ramps, etc.).

4.b) On non-limited access roadways, the use of a Flashing Arrow for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the Flashing Arrow.

4.c) The Flashing Arrow shall not be used on two lane, two-way roadways for temporary alternating one-way traffic operations.

4.d) The Flashing Arrow board display shall be in the "arrow" mode for lane closure tapers and in the "caution" mode (four corners) for shoulder work, blocking the shoulder, or roadside work near the shoulder. The Flashing Arrow shall be in the "caution" mode when it is positioned in the closed lane.

4.e) The Flashing Arrow shall not be used on a multi-lane roadway to laterally shift all lanes of traffic, because unnecessary lane changing may result.

SECTION 5. USE OF TRUCK MOUNTED IMPACT ATTENUATOR VEHICLES (TMAs)

5.a) For lane closures on limited access roadways, a minimum of two TMAs shall be used to install and remove traffic control patterns. If two TMAs are not available, the pattern shall not be installed.

5.b) On non-limited access roadways, the use of TMAs to install and remove patterns closing a lane(s) is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to utilize the TMAs.

5.c) Generally, to establish the advance and transition signing, one TMA shall be placed on the shoulder and the second TMA shall be approximately 1,000 feet ahead blocking the lane. The flashing arrow board mounted on the TMA should be in the "flashing arrow" mode when taking the lane. The sign truck and workers should be immediately ahead of

the second TMA. In no case shall the TMA be used as the sign truck or a work truck. Once the transition is in place, the TMAs shall travel in the closed lane until all Changeable Message Signs, signs, Flashing Arrows, and cones/drums are installed. The flashing arrow board mounted on the TMA should be in the "caution" mode when traveling in the closed lane.

5.d) A TMA shall be placed prior to the first work area in the pattern. If there are multiple work areas within the same pattern, then additional TMAs shall be positioned at each additional work area as needed. The flashing arrow board mounted on the TMA should be in the "caution" mode when in the closed lane.

5.e) TMAs shall be positioned a sufficient distance prior to the workers or equipment being protected to allow for appropriate vehicle roll-ahead in the event that the TMA is hit, but not so far that an errant vehicle could travel around the TMA and into the work area. For additional placement and use details, refer to the specification entitled "Type 'D' Portable Impact Attenuation System". Some operations, such as paving and concrete repairs, do not allow for placement of the TMA(s) within the specified distances. In these situations, the TMA(s) should be placed at the beginning of the work area and shall be advanced as the paving or concrete operations proceed.

5.f) TMAs should be paid in accordance with how the unit is utilized. When it is used as a TMA and is in the proper location as specified, and then it should be paid at the specified hourly rate for "Type 'D' Portable Impact Attenuation System". When the TMA is used as a Flashing Arrow, it should be paid at the daily rate for "High Mounted Internally Illuminated Flashing Arrow". If a TMA is used to install and remove a pattern and then is used as a Flashing Arrow, the unit should be paid as a "Type 'D' Portable Impact Attenuation System" for the hours used to install and remove the pattern, typically 2 hours (1 hour to install and 1 hour to remove), and is also paid for the day as a "High Mounted Internally Illuminated Flashing Arrow".

SECTION 6. USE OF TRAFFIC DRUMS AND TRAFFIC CONES

6.a) Traffic drums shall be used for taper channelization on limited-access roadways, ramps, and turning roadways and to delineate raised catch basins and other hazards.

6.b) Traffic drums shall be used in place of traffic cones in traffic control patterns that are in effect for more than a 36-hour duration.

6.c) Traffic Cones less than 42 inches in height shall not be used on limited-access roadways or on non-limited access roadways with a posted speed limit of 45 mph and above.

6.d) Typical spacing of traffic drums and/or cones shown on the Traffic Control Plans in the Contract are maximum spacings and may be reduced to meet actual field conditions as required.

SECTION 7. USE OF (REMOTE CONTROLLED) CHANGEABLE MESSAGE SIGNS (CMS)

7.a) For lane closures on limited access roadways, one CMS shall be used in advance of the traffic control pattern. Prior to installing the pattern, the CMS shall be installed and in operation, displaying the appropriate lane closure information (i.e.: Left Lane Closed - Merge Right). The CMS shall be positioned ½ - 1 mile ahead of the lane closure taper. If the nearest Exit ramp is greater than the specified ½ - 1 mile distance, than an additional CMS shall be positioned a sufficient distance ahead of the Exit ramp to alert motorists to the work and therefore offer them an opportunity to take the exit.

7.b) CMS should not be installed within 1000 feet of an existing CMS.

7.c) On non-limited access roadways, the use of CMS for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the CMS.

7.d) The advance CMS is typically placed off the right shoulder, 5 feet from the edge of pavement. In areas where the CMS cannot be placed beyond the edge of pavement, it may be placed on the paved shoulder with a minimum of five (5) traffic drums placed in a taper in front of it to delineate its position. The advance CMS shall be adequately protected if it is used for a continuous duration of 36 hours or more.

7.e) When the CMS are no longer required, they should be removed from the clear zone and have the display screen cleared and turned 90° away from the roadway.

7.f) The CMS generally should not be used for generic messages (ex: Road Work Ahead, Bump Ahead, Gravel Road, etc.).

7.g) The CMS should be used for specific situations that need to command the motorist's attention which cannot be conveyed with standard construction signs (Examples include: Exit 34 Closed Sat/Sun - Use Exit 35, All Lanes Closed - Use Shoulder, Workers on Road - Slow Down).

7.h) Messages that need to be displayed for long periods of time, such as during stage construction, should be displayed with construction signs. For special signs, please coordinate with the Office of Construction and the Division of Traffic Engineering for the proper layout/dimensions required.

7.i) The messages that are allowed on the CMS are as follows:

Message No.	Frame 1	Frame 2	Message No.	Frame 1	Frame 2
1	LEFT LANE CLOSED	MERGE RIGHT	9	LANES CLOSED AHEAD	REDUCE SPEED
2	2 LEFT LANES CLOSED	MERGE RIGHT	10	LANES CLOSED AHEAD	USE CAUTION
3	LEFT LANE CLOSED	REDUCE SPEED	11	WORKERS ON ROAD	REDUCE SPEED
4	2 LEFT LANES CLOSED	REDUCE SPEED	12	WORKERS ON ROAD	SLOW DOWN
5	RIGHT LANE CLOSED	MERGE LEFT	13	EXIT XX CLOSED	USE EXIT YY
6	2 RIGHT LANES CLOSED	MERGE LEFT	14	EXIT XX CLOSED USE YY	FOLLOW DETOUR
7	RIGHT LANE CLOSED	REDUCE SPEED	15	2 LANES SHIFT AHEAD	USE CAUTION
8	2 RIGHT LANES CLOSED	REDUCE SPEED	16	3 LANES SHIFT AHEAD	USE CAUTION

For any other message(s), approval must be received from the Office of Construction prior to their use. No more than two (2) displays shall be used within any message cycle.

SECTION 8. USE OF STATE POLICE OFFICERS

8.a) State Police may be utilized only on limited access highways and secondary roadways under their primary jurisdiction. One Officer may be used per critical sign pattern. Shoulder closures and right lane closures can generally be implemented without the presence of a State Police Officer. Likewise in areas with moderate traffic and wide, unobstructed medians, left lane closures can be implemented without State Police

presence. Under some situations it may be desirable to have State Police presence, when one is available. Examples of this include: nighttime lane closures; left lane closures with minimal width for setting up advance signs and staging; lane and shoulder closures on turning roadways/ramps or mainline where sight distance is minimal; and closures where extensive turning movements or traffic congestion regularly occur, however they are not required.

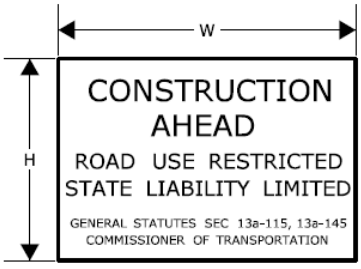
8.b) Once the pattern is in place, the State Police Officer should be positioned in a non-hazardous location in advance of the pattern If traffic backs up beyond the beginning of the pattern, then the State Police Officer shall be repositioned prior to the backup to give warning to the oncoming motorists. The State Police Officer and TMA should not be in proximity to each other.

8.c) Other functions of the State Police Officer(s) may include:

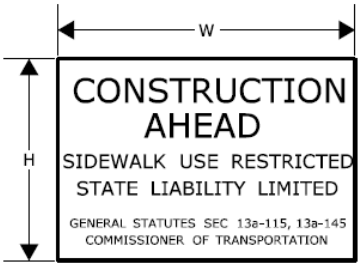
- Assisting entering/exiting construction vehicles within the work area.
- Enforcement of speed and other motor vehicle laws within the work area, if specifically requested by the project.

8.d) State Police Officers assigned to a work site are to only take direction from the Engineer.

SERIES 16 SIGNS



		W H
16-E	80-1605	84" x 60"
16-H	80-1608	60" x 42"
16-M	80-1613	30" x 24"



		W H
16-S	80-1619	48" x 30"

THE 16-S SIGN SHALL BE USED ON ALL PROJECTS THAT REQUIRE SIDEWALK RECONSTRUCTION OR RESTRICT PEDESTRIAN TRAVEL ON AN EXISTING SIDEWALK.

SERIES 16 SIGNS SHALL BE INSTALLED IN ADVANCE OF THE TRAFFIC CONTROL PATTERNS TO ALLOW MOTORISTS THE OPPORTUNITY TO AVOID A WORK ZONE. SERIES 16 SIGNS SHALL BE INSTALLED ON ANY MAJOR INTERSECTING ROADWAYS THAT APPROACH THE WORK ZONE. ON LIMITED-ACCESS HIGHWAYS, THESE SIGNS SHALL BE LOCATED IN ADVANCE OF THE NEAREST UPSTREAM EXIT RAMP AND ON ANY ENTRANCE RAMPS PRIOR TO OR WITHIN THE WORK ZONE LIMITS.

THE LOCATION OF SERIES 16 SIGNS CAN BE FOUND ELSEWHERE IN THE PLANS OR INSTALLED AS DIRECTED BY THE ENGINEER.

SIGNS 16-E AND 16-H SHALL BE POST-MOUNTED.

SIGN 16-E SHALL BE USED ON ALL EXPRESSWAYS.

SIGN 16-H SHALL BE USED ON ALL RAMPS, OTHER STATE ROADWAYS, AND MAJOR TOWN/CITY ROADWAYS.

SIGN 16-M SHALL BE USED ON OTHER TOWN ROADWAYS.

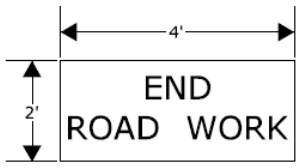
REGULATORY SIGN "ROAD WORK AHEAD, FINES DOUBLED"

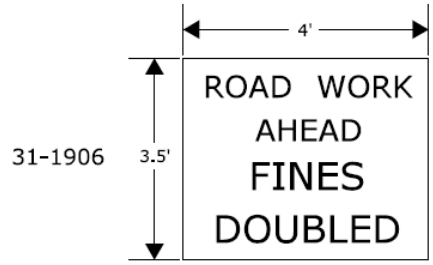
THE REGULATORY SIGN "ROAD WORK AHEAD FINES DOUBLED" SHALL BE INSTALLED FOR ALL WORK ZONES THAT OCCUR ON ANY STATE HIGHWAY IN CONNECTICUT WHERE THERE ARE WORKERS ON THE HIGHWAY OR WHEN THERE IS OTHER THAN EXISTING TRAFFIC OPERATIONS.

THE "ROAD WORK AHEAD FINES DOUBLED" REGULATORY SIGN SHALL BE PLACED AFTER THE SERIES 16 SIGN AND IN ADVANCE OF THE "ROAD WORK AHEAD" SIGN.

"END ROAD WORK" SIGN

THE LAST SIGN IN THE PATTERN MUST BE THE "END ROAD WORK" SIGN.





SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

REQUIRED SIGNS

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

Charles S. Harlow
2012.06.05 11:35:43-04'00'

PRINCIPAL ENGINEER

NOTES FOR TRAFFIC CONTROL PLANS

1. IF A TRAFFIC STOPPAGE OCCURS IN ADVANCE OF SIGN (A), THEN AN ADDITIONAL SIGN (A) SHALL BE INSTALLED IN ADVANCE OF THE STOPPAGE.

2. SIGNS (AA), (A), AND (D) SHOULD BE OMITTED WHEN THESE SIGNS HAVE ALREADY BEEN INSTALLED TO DESIGNATE A LARGER WORK ZONE THAN THE WORK ZONE THAT IS ENCOMPASSED ON THIS PLAN.

3. SEE TABLE 1 FOR ADJUSTMENT OF TAPERS IF NECESSARY.

4. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN TRAFFIC DRUMS SHALL BE USED IN PLACE OF TRAFFIC CONES.

5. ANY LEGAL SPEED LIMIT SIGNS WITHIN THE LIMITS OF A ROADWAY / LANE CLOSURE AREA SHALL BE COVERED WITH AN OPAQUE MATERIAL WHILE THE CLOSURE IS IN EFFECT, AND UNCOVERED WHEN THE ROADWAY / LANE CLOSURE IS RE-OPENED TO ALL LANES OF TRAFFIC.

6. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN ANY EXISTING CONFLICTING PAVEMENT MARKINGS SHALL BE ERADICATED OR COVERED, AND TEMPORARY PAVEMENT MARKINGS THAT DELINEATE THE PROPER TRAVELPATHS SHALL BE INSTALLED.

7. DISTANCES BETWEEN SIGNS IN THE ADVANCE WARNING AREA MAY BE REDUCED TO 100' ON LOW-SPEED URBAN ROADS (SPEED LIMIT < 40 MPH).

8. IF THIS PLAN IS TO REMAIN IN OPERATION DURING THE HOURS OF DARKNESS, INSTALL BARRICADE WARNING LIGHTS - HIGH INTENSITY ON ALL POST-MOUNTED DIAMOND SIGNS IN THE ADVANCE WARNING AREA.

9. A CHANGEABLE MESSAGE SIGN SHALL BE INSTALLED ONE HALF TO ONE MILE IN ADVANCE OF THE LANE CLOSURE TAPER.

10 SIGN (P) SHALL BE MOUNTED A MINIMUM OF 7 FEET FROM THE PAVEMENT SURFACE TO THE BOTTOM OF THE SIGN.

TABLE 1 - MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT (MILES PER HOUR)	MINIMUM TAPER LENGTH FOR A SINGLE LANE CLOSURE
30 OR LESS	180' (55m)
35	250' (75m)
40	320' (100m)
45	540' (165m)
50	600' (180m)
55	660' (200m)
65	780' (240m)

METRIC CONVERSION CHART (1" = 25mm)

ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC
12"	300mm	42"	1050mm	72"	1800mm
18"	450mm	48"	1200mm	78"	1950mm
24"	600mm	54"	1350mm	84"	2100mm
30"	750mm	60"	1500mm	90"	2250mm
36"	900mm	66"	1650mm	96"	2400mm

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

NOTES

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

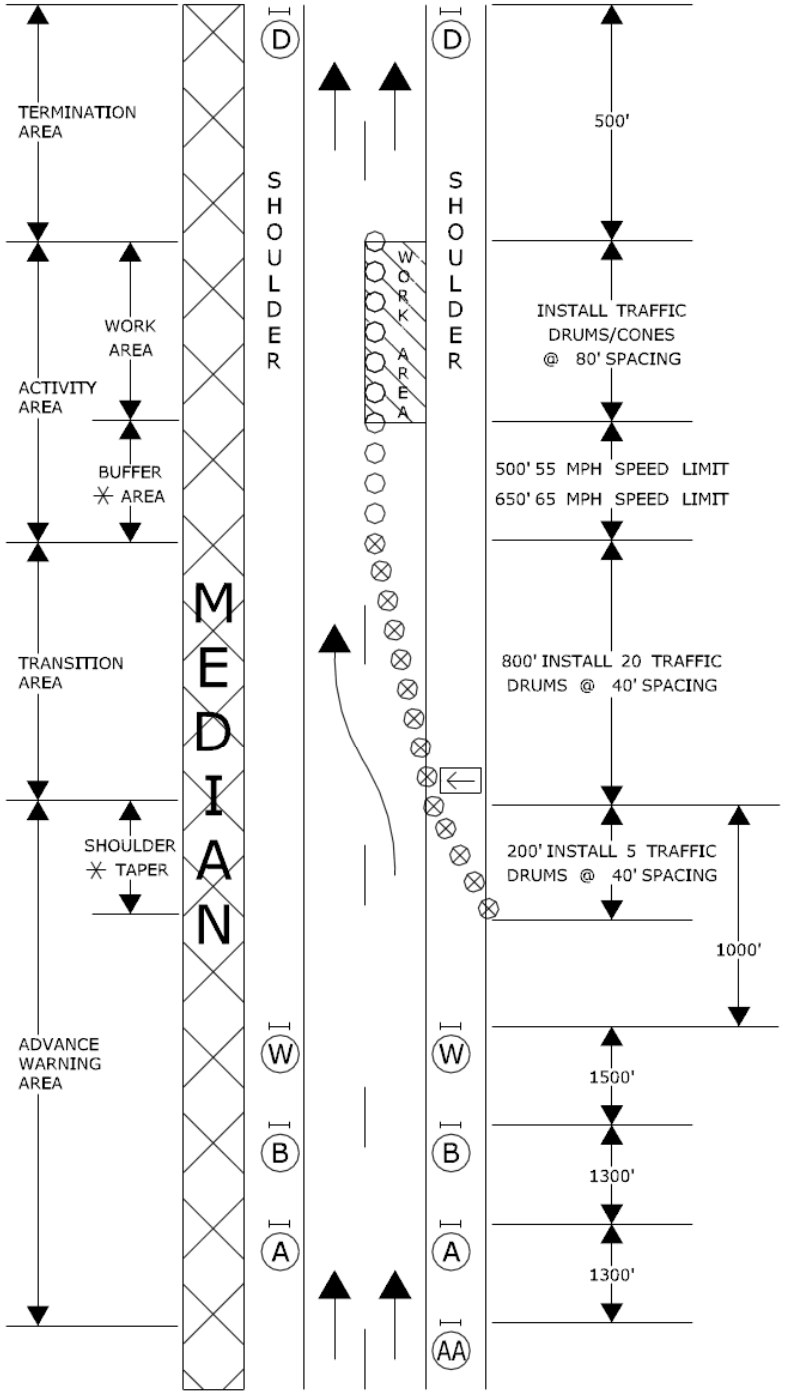
APPROVED

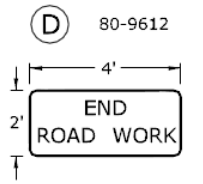
Charles S. Harlow
2012.06.05 15:50:35-04'00'

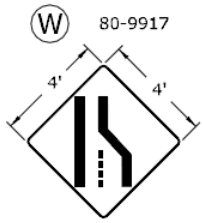
PRINCIPAL ENGINEER

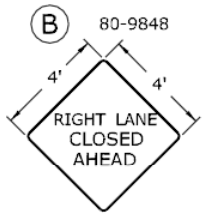
WORK IN RIGHT LANE - MULTILANE HIGHWAY

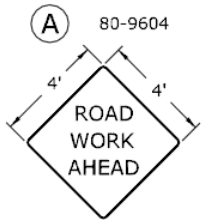
SIGN FACE
126 SQ. FT (MIN.)

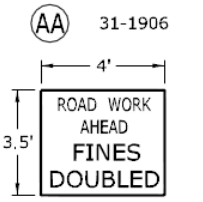












TRAFFIC CONE **OR** TRAFFIC DRUM
OPTIONAL TRAFFIC DRUM PORTABLE SIGN SUPPORT
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 1

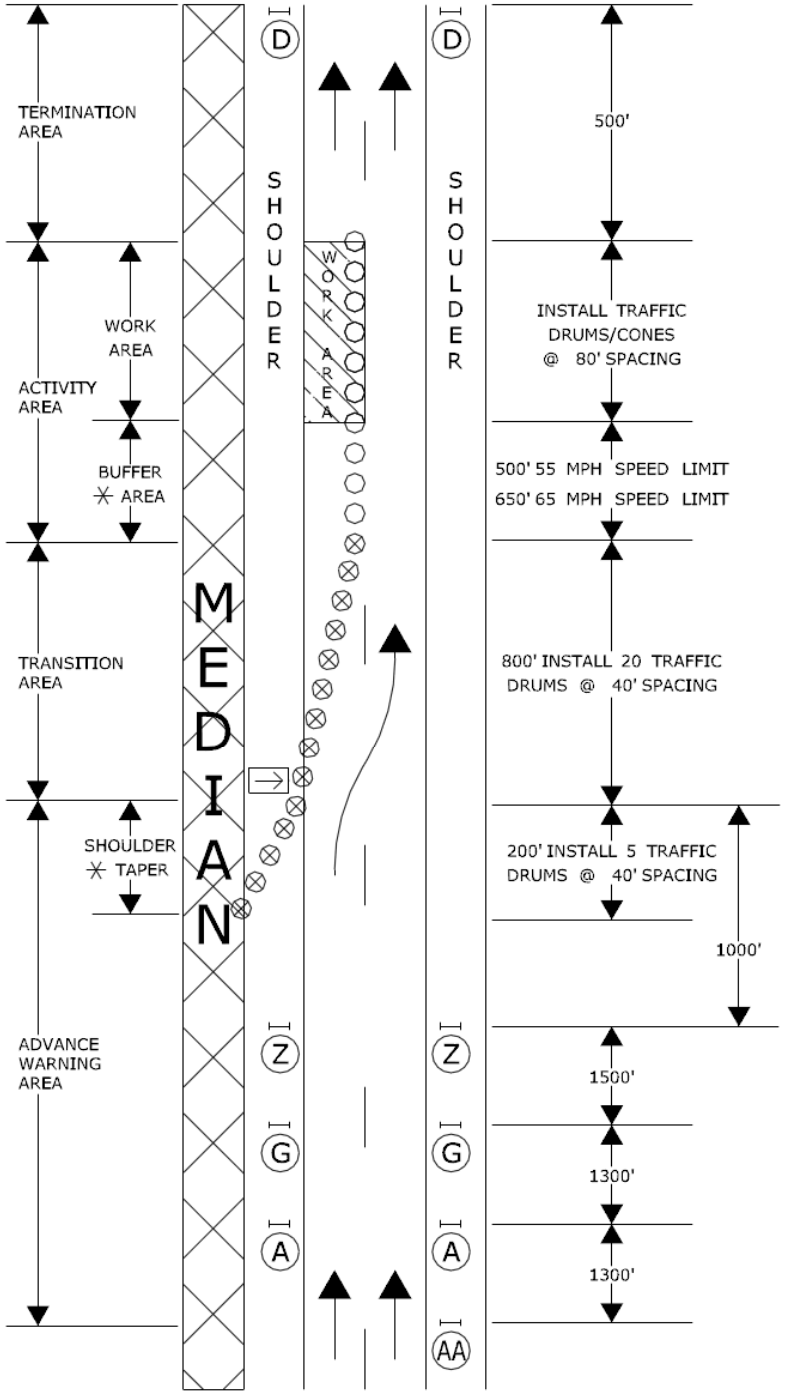
SEE NOTES 1, 2, 3, 4, 5, 6, 8, 9

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

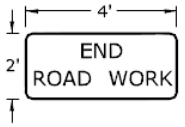
APPROVED Charles S. Harlow 2012.06.05 15:51:00-04'00'
PRINCIPAL ENGINEER

WORK IN LEFT LANE - MULTILANE HIGHWAY

SIGN FACE
126 SQ. FT (MIN.)



D 80-9612

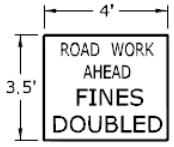


Z 80-9918

G 80-9847

A 80-9604

AA 31-1906



TRAFFIC CONE **OR** TRAFFIC DRUM
OPTIONAL TRAFFIC DRUM PORTABLE SIGN SUPPORT
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 3

SEE NOTES 1, 2, 3, 4, 5, 6, 8, 9

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.06.05 15:51:46-04'00'
PRINCIPAL ENGINEER

ITEM NO. 0974001A – REMOVAL OF EXISTING MASONRY

Work under this item shall conform to the requirements of Section 9.74 supplemented and amended as follows:

9.74.03 –Construction Methods: Add the following:

The concrete abutments, wingwalls, stem and backwalls, along with pier keeper blocks shall be removed to the limits as shown on the plans in a sequence and manner which follows the overall stage construction plans for the project. Where stage construction requires concrete to be removed adjacent to abutment sections that will continue to support live load, the Contractor shall cut the concrete at the demolition limit to minimize disturbance to the section to remain in place. The method and equipment proposed by the Contractor shall be submitted to the Engineer for review.

Under no circumstances shall the Contractor be allowed to use excavator mounted pneumatic demolition equipment to remove the existing abutment and wingwall concrete where vibration may damage sections remaining in service. Maximum 30 pound hammers shall be used for general removal, and 15 pound hammers shall be used immediately adjacent to the cut lines at the demolition limit.

The Contractor shall take necessary precautions to prevent any damage to the portions of the structure to remain. Any damage shall be repaired by the Contractor, as directed by the Engineer, at no cost to the State.

All debris shall be disposed of by the Contractor in accordance with all applicable State and Federal regulations.

9.74.05- Basis of Payment: Add the following:

No additional payment will be made for all saw cutting required for the staged removal of existing concrete at abutments, wingwalls and piers. The cost of this work shall be included in the unit price per cubic yard for “Removal of Existing Masonry.”

Rev. Date 4/22/14

Rev. January 2016 Supplements

ITEM #0979003A - CONSTRUCTION BARRICADE TYPE III

Article 9.79.01 – Description: The Contractor shall furnish construction barricades to conform to the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH) and to the requirements stated in Article 9.71 "Maintenance and Protection of Traffic," as shown on the plans and/or as directed by the Engineer.

Article 9.79.02 – Materials: Prior to using the construction barricades, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices have been crash tested and have approval in writing from FHWA conforming to the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH), as appropriate.

Alternate stripes of white and orange Type III or Type VI reflective sheeting shall be applied to the horizontal members as shown on the plans. Application of the reflective sheeting shall conform to the requirements specified by the reflective sheeting manufacturer. Only one type of sheeting shall be used on a barricade and all barricades furnished shall have the same type of reflective sheeting. Reflective sheeting shall conform to the requirements of Article M.18.09.01.

Construction barricades shall be designed and fabricated so as to prevent them from being blown over or displaced by the wind from passing vehicles. Construction barricades shall be approved by the Engineer before they are used.

Article 9.79.03 – Construction Methods: Ineffective barricades, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices", shall be replaced by the Contractor at no cost to the State.

Barricades that are no longer required shall be removed from the project and shall remain the property of the Contractor.

Article 9.79.04 – Method of Measurement: Construction Barricade Type III will be measured for payment by the number of construction barricades required and used.

Article 9.79.05 – Basis of Payment: "Construction Barricade Type III" required and used will be paid for at the Contract unit price per each. Each barricade will be paid for once, regardless of the number of times it is used.

Pay Item	Pay Unit
Construction Barricade Type III	EA.

ITEM #1003906A - REMOVE LIGHT STANDARD

DESCRIPTION: Under this item the contractor shall remove an existing light standard with transformer base, bracket, luminaire, and ballast as indicated on the plans or as directed by the Engineer. Removed aluminum light standards, aluminum transformer bases, aluminum brackets, and luminaires, shall remain the property of the Department of Transportation. Removed steel light standards, steel transformer bases, lamps, and remote ballasts shall remain the property of the Contractor.

MATERIALS: The Contractor shall be responsible for damage to all equipment and material incurred during removal and hauling to the specified area. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

CONSTRUCTION METHODS: The Contractor shall remove a light standard, base, bracket, luminaire, and ballast, where required. Removed aluminum light standards with aluminum transformer bases, brackets, luminaires and ballasts, shall remain the property of the Department of Transportation. All steel light standards, steel transformer bases, lamps, and remote ballasts shall be disposed of by the Contractor.

The Contractor shall contact ConnDOT Stores (tel: 860-566-3263) to determine the storage facility where the salvageable materials are to be delivered. Contact shall be made with the Materials Storage Manager at least 24 hours in advance to coordinate unloading and storage. The Contractor shall load, transport, and unload the material. The material shall be stacked and stored according to the directions of the Materials Storage Manager. The condition of the material is to be determined by the State Inspector responsible for this project. Strict adherence to proper stores documentation, Directive 19 - "Transfer of Salvage Material from Project to Stores", is mandatory. Any material not meeting this criteria will be refused.

H.I.D. lamps which are to be disposed of by the Contractor, must be handled as hazardous waste, and be subject to the provisions of the Resources Conservation and Recovery Act (RCRA) Subtitle C and chapter 446 of the Connecticut General Statutes. The removed lamps shall not be landfilled or incinerated, but must be handled and disposed of, or recycled, at an approved facility.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of light standards with associated equipment removed and disposed of or delivered to the specified location, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove Light Standard" complete, which price shall include the removal of light standards with associated transformer bases, brackets, luminaires, lamps, cable and hardware, delivering, disposing, hauling, storing, and including all materials, tools, equipment, labor and work incidental thereto.

Pay Item - Pay Unit table missing

ITEM #1003912A - REMOVE CONCRETE LIGHT STANDARD BASE

DESCRIPTION: Under this item the contractor shall remove an existing concrete light standard base where shown on the plans or as directed. The removed concrete base shall remain the property of the contractor.

CONSTRUCTION METHODS: The contractor shall remove a concrete light standard base where indicated on the plans or as directed by the Engineer. The removed base shall be properly disposed of by the contractor. The resulting excavation shall be backfilled, top soiled, graded and seeded to match surroundings in conformance with Section M.13, unless otherwise noted on the plans.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of concrete light standard bases removed and disposed of, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove Concrete Light Standard Base", which price shall include all materials, equipment and work incidental thereto including removal of base, excavation, backfill, topsoil, grading, seeding, fertilizing, hauling and disposing of concrete base.

Pay Item - Pay Unit table missing

ITEM #1003916A - REMOVE AND RELOCATE LIGHT STANDARD

DESCRIPTION: Under this item the Contractor shall remove, temporarily store as required, and install an existing light standard where shown on the plans, or as directed by the Engineer. The installation shall consist of erecting the light standard with bracket, ballast, luminaire and lamp onto a new foundation/anchorage, and making all necessary electrical connections for proper operation.

MATERIALS: The Contractor shall be responsible for damage to all equipment and materials incurred during removal and hauling to the specified area. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

CONSTRUCTION METHOD: The Contractor shall remove a light standard, bracket, luminaire and ballast where indicated on the plans, or as directed by the Engineer. The Contractor shall effectively disconnect the luminaire from the lighting circuit and detach the pole from the grounding system. The Contractor shall remove the four anchor nuts with associated hardware and remove the light standard from the foundation/anchorage. The light standard, bracket arm, luminaire and mounting hardware shall be properly stored as a unit away from traffic and sources of possible damage.

Upon installation of the new foundation/anchorage (paid for under separate bid item), the removed light standard shall be bolted securely to the anchor bolts. The completely assembled light standard shall be erected plumb with the aid of aluminum shims, if necessary. The bracket shall be securely attached to the light standard and the assembly shall be erected with the bracket placed perpendicular to the center line of the roadway.

The light standard shall be connected to the ground rod and grounding system and the luminaire shall be reconnected to the lighting circuit as indicated on the plans.

The Contractor shall make all necessary arrangements with the District Electrical Maintenance Supervisor, for locking and unlocking of the circuits on which any work is to be done, through the Engineer.

All work shall be in strict conformance with the National Electric Code.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of light standards removed and relocated, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove and Relocate Light Standard" as specified, which price shall include removal, storage, delivery, and installation of the light standard, connections, and all work, materials, tools and equipment incidental thereto.

Pay Item - Pay Unit table missing

ITEM #1010025A – CONCRETE HANDHOLE EXTENSION – TYPE 1

Description: Work under this item shall consist of furnishing and installing a pre-cast concrete extension on a Type 1 concrete handhole where required in conformance with the specification or as directed by the Engineer.

Materials: Concrete Handhole Extension – Type 1 shall conform to the material requirements of Section 10.10.

Mortar shall conform to Section M.11.04.

Construction Methods: Work under this item shall consist of furnishing and installing a per-cast concrete extension on a Type 1 concrete handhole where required, in conformance with this specification, or as directed by the Engineer. The handhole extension shall be installed on an existing Type 1 concrete handhole at the location as indicated on the plans. Handhole extensions with a depth of 6" shall be utilized. The outside and inside dimensions of the pre-cast extension shall match those of the existing Type 1 handhole.

Prior to installation of the extension, the top of the existing handhole shall be suitably cleaned to accept the mortar bed. The pre-cast handhole extension shall be attached to the top of the existing handhole with a suitable mortar bed. Excess mortar shall be removed from the inside walls of the handhole and the resulting mortar joint smoothed.

The existing steel handhole cover shall be re-installed on the pre-cast extension.

Method of Measurement: This work will be measured for payment by the number of "Concrete Handhole Extension – Type 1" installed, complete and accepted.

Basis of Payment: This work will be paid for at the contract unit price each for "Concrete Handhole Extension – Type 1" which price shall include all pre-cast extension, mortar, cleaning, removal and installation of cover, and all equipment, labor, deliver and incidentals thereto.

Pay Item - Pay Unit table missing

ITEM #1010901A – REMOVE AND RELOCATE CONCRETE HANDHOLE

Description: Under this item the Contractor shall remove, temporarily store as required, and reinstall an existing concrete handhole to the location shown on the plans. The installation shall consist of relocating a concrete handhole to the location indicated, and returning any areas disturbed by the excavation to final grade as shown on the plans or as directed by the Engineer.

Materials: The Contractor shall be responsible for damage to all equipment and materials incurred during removal and hauling to specified areas. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

Construction Methods: The Contractor shall remove concrete handholes and relocate them to areas as indicated on the plans, or as directed by the Engineer. Areas disturbed by the excavation for the handholes shall be neatly graded to conform to the adjacent contours. Where topsoil has been removed, it shall be fertilized, seeded and mulched.

Method of Measurement: This work will be measured for payment by the number of concrete handholes removed and relocated complete and accepted.

Basis of Payment: This work will be paid for at the contract unit price each for "Remove and Relocate Concrete Handhole" as specified, which price shall include removal, storage, relocating, trenching, installation, grading and placing topsoil, seeding, fertilizing, mulching and all equipment, tools, labor, and work incidental thereto.

Pay Item - Pay Unit table missing

ITEM #1014901A - REMOVE CABLE

DESCRIPTION: This item shall consist of removing conductors and cables from existing cabinets, conduit and handholes where indicated in the plans or as directed by the Engineer and in accordance with these specifications. The removed conductors and cables shall remain the property of the Contractor.

CONSTRUCTION METHOD: The Contractor shall remove all conductors and cables from existing cabinets, conduit and handholes at the location where new conductors and cables are to be installed. Prior to installing the new conductors and cables, all existing conductors and cables shall have been removed, neatly coiled, tied and the conduit reamed cleaned. The removed conductors and cables shall be disposed of by the Contractor.

Nighttime illumination shall not be interrupted by this work.

METHOD OF MEASUREMENT: This work shall be measured for payment by the actual number of linear feet of conduit from which all conductors are removed, also including the length of handholes, junction boxes, and cabinets.

BASIS OF PAYMENT: This work will be paid for at the contract unit price per linear foot for "Remove Cable" which price shall include the removal of all conductors and cables, the cleaning of conduit, the proper disposal of the removed conductors and cables, and all equipment, labor and work incidental thereto.

Pay Item - Pay Unit table missing

Rev. date?

this item not on DES

ITEM #1015034A – GROUNDING AND BONDING

Description: The work of this Section consists of furnishing and installing grounding and bonding systems for the bridges being replaced as shown on the plans and as specified herein. Work also includes the removal of the existing grounding and bonding systems on the existing bridges, as well as the furnishing, installation, and removal of temporary grounding and bonding systems during the different bridge demolition and construction stages.

Work includes providing all materials, labor, tools, equipment, supervision and all appurtenances as required for a complete grounding and bonding installation. The grounding and bonding systems shall meet the requirements of the National Electrical Code, National Electric Safety Code and the technical and safety recommendations of ANSI and IEEE.

The Contractor shall provide new and temporary grounding and bonding for all construction stages of the project work, including but not limited to:

Temporary Protective Fencing Panel posts shall be bonded to each other and to the existing and new bridge bonding system as shown on the plans.

is it shown?

The new bridge bonding system shall be bonded temporarily and permanently to the existing bridge bonding system and railroad static wires as shown on the plans.

New Metal Bridge Rail (Solid Panel) posts shall be bonded to each other and to the new bridge bonding system as shown on the plans.

New bonding loops on each new bridge parapet shall be connected to the existing railroad static wires as show on the plans.

New aluminum plates attached to the bottoms of the new bridge deck units shall be bonded to each other and temporarily to the existing bridge bonding system as shown on the plans.

New aluminum plates attached to the bottoms of the new bridge deck units shall be bonded to each other and to the new parapet mounted bonding loop as shown on the plans.

Applicable Standards: Pertinent provisions of the following listed standards (latest edition) shall apply to the work of this Section, except as they may be modified herein, and are hereby made a part of this Specification to the extent required.

Organi-zation	Number	Title
NFPA	70	National Electrical Code (NEC)

IEEE	81	Recommended Guide for Measuring Ground Resistance and Potential Gradients in the Earth
	C2	National Electrical Safety Code (NESC)
ASTM	B231	Concentric-lay-Stranded Aluminum Conductors
	A123	Standard Specifications for Zinc (Hot-Dipped Galvanized) Coatings
AA	I-90	Aluminum Standards and Data

Submittals: Test Reports: Reports of all field tests including method of measurement shall be submitted to the Engineer as required by these Specifications and referenced standards.

Certified copies of the test results on cables and other materials, supplied under this section, as per relevant standards.

The Contractor shall submit product data for all components in this Section, which shall include shop/working drawings, material/procurement specifications and other related information for each component. Component and assembly drawings shall be prepared using AutoCAD 2004.

is this correct?

The Contractor shall submit shop drawings, technical data, product data, and certificates for all materials furnished under this section including manufacturer's descriptive literature, installation recommendations, catalog data, and other information required to demonstrate compliance with the Contract Documents, including but not limited to:

A. Conductors for Bond Wires
   1. Conductor for Bonding Loop
   2. Conductor for Bonding Wires
   3. Conductor for Flexible Bond Wire Jumper

B. Aluminum Plates
   1. Shop drawing showing sizes, dimensions, and bolt holes

C. Connectors, Terminal Lugs, Bolts, Washers, Lock Washers, and Nuts

D. Unistrut type channels and associated hardware
   1. Channel type, size, and finish
   2. Attachment bolts, washers, and bolts
   3. Channel nut with spring
   4. Cast-In-Place inserts

E. Inserts
   1. For cast-in-place locations
   2. For drilled-in-place locations

The Contractor shall furnish certification from the manufacturer verifying that the wires have been designed, manufactured, inspected and tested in accordance with applicable portions of the referenced standards, these Specifications, and the plans.

Materials: All components shall conform to or be interchangeable with the Railroad's standard components.

Conductors for grounding and bonding shall be Class B, covered 4/0 AWG 1350 Aluminum 19 strand type H19.

Terminal Lugs shall be aluminum compression type with either one or two hole for bolted connections. Flexible Bond Wire Jumpers shall be Class B, covered 4/0 AWG 1350 Aluminum 19 strand type H19 as shown on the drawings.

Aluminum plates shall be electrical grade aluminum alloy (6101-T61) and sized as shown on the drawings.

Connection of aluminum plates shall be by ½" diameter, hex-head bolts, nuts, and washers. Bolts, nuts, and washers shall be of stainless steel.

Mounting channels on the bottoms of the bridge beams for attachment of the bonding system aluminum plates shall be Unistrut P1000T channels, or an approved equal. Mounting channels shall have a hot-dipped galvanized finish.

All materials shall be protected against damage during handling and shipping. Each reel or bundle shall have a strong, weatherproof tag securely fastened showing the physical and mechanical properties as well as type designation, ASTM designation and the name and mark of the manufacturer, and the total length and weight of the cable or bundle.

Construction Methods: The installation of the bridge bonding system will occur in the vicinity of electrical energized facilities. De-energizing of the Railroad's electric lines will be required to perform the work.

All hardware shall be installed as shown on the plans and as recommended by the manufacturer. Bolts, and nuts shall be properly tightened in accordance with the manufacturer's recommendations. All bolts shall be of sufficient length for a full thread beyond the nut, but shall not protrude beyond the nut and/or locknut more than ½". Bolt ends shall not be cut off.

Hardware shall be installed using tools and methods specified by the manufacturer and approved by the Engineer.

Hardware shall be inspected for cleanliness and damage. Any item that does not fit or is defective shall be rejected. Replacement shall be at the Contractor's expense.

Current-carrying connectors shall be as shown on the plans and shall be installed in accordance

with the manufacturer's recommendations. Connectors for bimetallic connections shall be tin-plated.

Bolts in bolt-type connectors shall be lubricated as recommended by the manufacturer, and torqued, using a calibrated torque wrench.

Wire surfaces, which are in contact with conducting surfaces of the connector, shall be thoroughly wire brushed and shall be coated with an inhibitor. When connectors are not factory-supplied with a corrosion inhibitor, the inhibitor shall be applied to the connector in the field. Corrosion inhibitors shall be stable over a wide temperature range, adhere to cold metal surfaces, be water-repellent, be weather resistant, and be inert to copper, aluminum, zinc, tin, cadmium,, steel, and neoprene rubber.

All conductors shall be handled in accordance with good overhead line practices and the manufacturer's recommendations.

Wire splices are not allowed without prior approval of the Engineer. No splice will be permitted within five feet of a support clamp.

Any damage to wires and conductors shall be reported, in writing, to the Engineer. Remedial action must be approved by the Engineer and will be performed as directed at the Contractor's expense.

During conductor installation, proper vertical and horizontal electrical clearances must be maintained from existing wires and structures.

Electrical resistance tests shall be made during and after installation to verify continuity of the grounding and bonding system.

Method of Measurement: The work under this Section will be measured on a lump sum basis which will include all materials, labor, equipment, testing, and coordination with the Railroad required for a complete and functional installation.

There shall be no separate or additional payment for the work associated with the furnishing, installation, and/or removals of temporary grounding or bonding materials.

Basis of Payment: This work will be paid for at the contract lump sum price for the following pay item which shall include all transportation, materials, equipment, tools, and labor incidental thereto.

Pay Item	**Pay Unit**
GROUNDING AND BONDING	LS

ITEM #1019027A - PRE-ASSEMBLED AERIAL CABLE

DESCRIPTION: This work shall consist of furnishing and installing pre-assembled aerial cable, with insulators and brackets, on proposed poles at the location indicated on the plans to maintain illumination circuits.

MATERIALS: Pre-assembled aerial cable shall be 7 strand aluminum containing a No. 6 AWG bare messenger with three No. 6 AWG cross-linked polyethylene insulated conductors rated at 600 volts.

CONSTRUCTION METHOD: The pre-assembled aerial cable shall be attached to poles with insulators, including all connections as indicated on the plans or as directed by the Engineer. When necessary, the pre-assembled aerial cable shall be relocated to maintain different illumination circuits as dictated by the construction stages. Pre-assembled aerial cable used for temporary lighting shall be removed once the permanent lighting is installed and operational. Removed aerial cable shall remain the property of the Contractor.

Pre-assembled aerial cable shall be used to maintain ramp lighting circuits and mainline circuits where the need for large diameter cable is not necessary to maintain proper voltage drop levels.

METHOD OF MEASUREMENT: This work will be measured for payment by the actual number of linear feet of pre-assembled aerial cable installed and accepted, including attachments.

BASIS OF PAYMENT: This work will be paid for at the contract unit price per linear foot for "Pre-Assembled Aerial Cable" of the size and voltage specified, complete in place, which price shall include, insulators, entrance cap and attachment, bracket, all materials, tools, connections, equipment, labor, and work incidental thereto. The unit cost for this item is a one time only cost. The cost of removing and relocating the aerial cable to maintain different illumination circuits shall be included in the unit cost.

Pay Item - Pay Unit table missing

ITEM #1020030A - TEMPORARY ILLUMINATION UNIT

DESCRIPTION: Under this item the Contractor shall furnish and install a breakaway fiberglass light pole, anchors, bracket, luminaire with ballast, and necessary hardware for temporary lighting during construction, as indicated on the plans or as directed by the Engineer. At the end of the project the temporary illumination unit shall become the property of the Contractor.

MATERIALS: The pole shaft shall be fiberglass reinforced composite (FRC). The pole shaft shall be constructed by the filament winding process from thermosetting polyester resin and contain a minimum of 65 percent of "E" type fiberglass by weight. The filament windings shall be continuously applied with uniform tension and shall be placed on the pole helically at low angles to provide axial strength. Additional windings shall be placed on the pole in a circular manner to provide compressive strength. The resin is to be uniformly pigmented to match the final grey color of the finished FRC pole. The pole is to contain solid coloration throughout the entire wall thickness and is to contain ultraviolet (UV) inhibitors. The pole is to be round, tapered, hollow, and reinforced in the support arm and hardware attachment areas. The pole is to be non-conductive and chemically inert. The pole shall meet the current AASHTO LTS-2 *Street Lighting Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, and shall be approved by FHWA for use on Federal Aid projects. A 2 ½" x 5" handhole shall be provided at the base of the pole shaft at approximately 18" above the finished grade line.

The pole exterior surface is to be grey with a natural (textured) finish. The surface of the pole will be uniform for the entire length of the pole. The laminate shall contain colored pigment, the color of the final coating, and be of uniform color throughout the entire wall thickness of the pole. A coating shall be applied to the pole to maintain surface integrity against the damaging effects of sunlight and extremes in weather. The coating is to be highly weather resistant pigmented polyurethane. The coating thickness shall have minimum dry film thickness of 1-1/2 mils.

The surface shall be tested for a minimum of 5000 hours of accelerated testing in accordance with ASTM G154 (UV-A lamp 340 NM wave length, 130 degree F, cycle lamp 4 hours on 4 hours off) with the following results:

Fiber exposure:	none
Crazing:	none
Checking:	none
Chalking:	none
Color:	may dull slightly

The minimum pole weight shall be 130 lbs. The weight of each pole shall not deviate from the specified weight by more than +/- 10 lbs.

For direct buried break-away poles the butt end shall be enlarged so as to provide resistance to rotation and pull out.

Where indicated on the plans, the pole shaft shall be equipped with an anchor base with of heavy duty A356-T6 aluminum which shall be permanently bonded to the outside of the fiberglass shaft.

Each pole is to be permanently marked in characters 3/16" minimum high on a brass or stainless steel plate with the manufacturer's identification symbol, month and year of manufacture. Each pole shall be individually packaged for protection during shipping and storage. The pole shall be warranted to be free of defects in materials and workmanship for a period of three years from the date of purchase.

The top of the pole is to be pre-drilled for two 5/8" thru bolts on 9-1/2" centers starting 4 inches below the top of the pole. A 1-1/2" wire exit hole shall be centered 1/2 the distance between the two holes.

A cast aluminum removable cap shall be securely mounted to the top of the pole. The cap shall be corrosion resistant and must remain in place when subjected to the maximum wind loading for which the pole is designed.

The luminaire bracket arm shall be 10' in length (single member) of an upsweep design fabricated from tubular aluminum. The luminaire end shall have a 2-3/8" outside diameter.

Anchors shall conform to the pertinent requirements of Article M.16.04-2b, c, d, and e.

The luminaire shall conform to the pertinent requirements of Article M.15.05, and shall be high pressure sodium. The luminaire wattage shall be 250 watt or as called for on the plans. The socket shall be adjustable to provide I.E.S. light distribution type M-S-II. The ballast shall be under guarantee of the manufacturer for a period of one year commencing when the unit is installed and accepted

CONSTRUCTION METHOD: The fiberglass pole shall be set in the earth to the required depth and proper compaction of backfill provided around the pole and then attached to the anchors with guys as necessary. The bracket shall be attached to the pole and shall provide a luminaire mounting height of 40' over the roadway or the mounting height as called for on the illumination plans (See contractor "Notes" section). The bracket and luminaire assembly shall be installed perpendicular to the center line of the roadway. When necessary, the temporary light pole and luminaire shall be relocated to maintain different illumination circuits as dictated by the construction stages.

Where indicated on the plans an anchor base type pole shall be supplied and securely bolted to the anchor bolts of the foundation and leveled with the aid of aluminum shims if necessary.

Upon completion of the project the temporary illumination unit shall be removed and shall remain the property of the Contractor.

Upon removal of the pole, the resulting excavation shall be properly backfilled to match the surrounding area.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of temporary illumination units installed and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "TEMPORARY ILLUMINATION UNIT" complete in place, which price shall include all materials, fiberglass poles, breakaway base, anchor base (when required), anchors, guys, brackets, luminaires, lamps, ballasts, hardware, connections, hauling, and all equipment, tools, labor and all work incidental thereto including excavating, augering, removal of bituminous overlay, backfilling, removal, hauling, relocation, and disposal. The unit cost for this item is a one time only cost. The cost of removing and relocating the temporary illumination unit to maintain different illumination circuits shall be included in the unit cost.

Pay Item - Pay Unit table missing

ITEM # 1210101A – 4" (100 mm) WHITE EPOXY RESIN PAVEMENT MARKINGS

ITEM # 1210102A – 4" (100 mm) YELLOW EPOXY RESIN PAVEMENT MARKINGS

ITEM # 1210103A – 6" (150 mm) WHITE EPOXY RESIN PAVEMENT MARKINGS

ITEM # 1210105A – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS

SECTION 12.10 – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS is amended as follows:

*Delete "**SYMBOLS AND LEGENDS**" from the title of the section.*

SECTION 12.10.03 – Construction Methods is amended as follows:

*Delete the entire sections titled "**3. Performance and Warranty:**" and "**WARRANTY:**" and replace them with the following:*

3. Initial Performance: The retroreflectivity of the markings applied must be measured by the Contractor three (3) to fourteen (14) days after installation. A Certified Test Report (CTR), in accordance with Section 1.06.07, must be submitted to the Engineer no later than ten (10) days after the measurements are taken using the procedures and equipment detailed below:

Test Lots - The following test lots shall be randomly selected by the Engineer to represent the line markings applied:

Table 3.1: Line Test Lots

Length of line	Number of Lots	Length of Test Lot
< 1.0 mi. (1.5 km)	1	1000 ft. (300 m)
≥1.0 mi. (1.5 km)	1 per 1.0 mi. (1.5 km)	1000 ft. (300 m)

Measurement Equipment and Procedure

Portable Retroreflectometer

1. Skip line measurements shall be obtained for every other stripe, taking no more than two readings per stripe with readings no closer than 20 in. (0.5 m) from either end of the marking.
2. Solid line test lots shall be divided into ten sub-lots of 100 ft. (30 m) length and measurements obtained at one randomly select location within each sublot.
3. For symbols and legends, 10 percent of each type shall be measured by obtaining five (5) measurements at random locations on the symbol or legend.
4. The Apparatus and Measurements shall be made in accordance with ASTM E1710 (Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer) and evaluated in accordance with ASTM D7585/D7585M (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments).

Mobile Retroreflectometer

1. Calibration of the instruments shall be in accordance with the manufacturer's instructions.
2. Retroreflectivity shall be measured in a manner proposed by the Contractor and approved by the Engineer. The basis of approval of the test method will be conformance to a recognized standard test method or provisional standard test method.

The measurements shall be obtained when the pavement surface is clean and dry and shall be reported in millicandellas per square foot per foot candle - mcd/ft^2/fc (millicandelas per square meter per lux (mcd/m^2/lux)). Measurements shall be obtained sequentially in the direction of traffic flow.

Additional Contents of Certified Test Report

The CTR shall also list:

- Project and Route number
- Geographical location of the test site(s), including distance from the nearest reference point.
- Manufacturer and model of retroreflectometer used.
- Most recent calibration date for equipment used.
- Grand Average and standard deviation of the retroreflectivity readings for each line, symbol or legend.

Initial Performance:

In order to be accepted, all epoxy resin pavement markings must meet the following minimum retroreflectivity reading requirement:

White Epoxy: minimum retroreflectivity reading of 400 mcd/ft^2/fc (mcd/m^2/lux)
Yellow Epoxy: minimum retroreflectivity reading of 325 mcd/ft^2/fc (mcd/m^2/lux)

At the discretion of the Engineer, the Contractor shall replace, at its expense, such amount of lines, symbols and legends that the grand average reading falls below the minimum value for retro-reflectivity. The Engineer will determine the areas and lines to be replaced. The cost of replacement shall include all materials, equipment, labor and work incidental thereto.

contact Brien Smith in the DOT Traffic Unit
for updated special provision

Rev. date?

ITEM #1216020A 6" BLACK AGGREGATE COVER-UP RESIN PAVEMENT MARKINGS

ITEM #1216021A 8" BLACK AGGREGATE COVER-UP RESIN PAVEMENT MARKINGS

ITEM #1216024A BLACK AGGREGATE COVER-UP RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS

12.16.01—Description: This item shall consist of furnishing and installing black aggregate cover-up resin pavement markings of the width specified to cover existing markings in accordance with this section and in conformance with the plans or as directed by the Engineer.

The black aggregate cover-up resin pavement markings shall be a highly durable, skid resistant, non-reflective material designed to cover existing pavement markings.

The black aggregate cover-up resin pavement marking material, when applied according to the recommendations of the manufacturer, shall provide a neat, durable masking that will not flow or distort. The black aggregate cover-up resin pavement marking material shall be weather resistant and, through normal traffic wear, shall show no wearing which would significantly impair the intended usage.

12.16.02—Materials: Materials for this work shall conform to the requirements of Article M.07.25.

12.16.03—Construction Methods: The black aggregate cover-up resin pavement markings shall be applied strictly in accordance with the manufacturer's recommendations and installed as shown on the plans and to the control points as established by the Engineer.

The areas to be covered shall be dry and sufficiently cleaned of sand and debris so as to provide an acceptable bond. All surfaces which are power washed shall be allowed to dry sufficiently prior to the application of the black aggregate cover-up resin pavement markings. The areas that have been pre-marked shall be broom cleaned immediately prior to the application of the black aggregate cover-up resin pavement markings.

Operations shall be conducted only when the road surface temperatures are 32° F (0° C) or greater. Operations shall be discontinued during periods of rain, and shall not continue until the Engineer determines that the pavement surface is dry enough to achieve adhesion. The cover-up resin pavement markings shall be applied uniformly to a prepared surface in a manner that ensures a wet film thickness (without black aggregate) of 20 mils +/- 1 mils (500 um +/- 25 um).

s/b 10 see supplements (errata)

Black aggregate shall be applied at a rate of 100 pounds per gallon (12 kilograms per liter) of black aggregate pavement marking material. The black aggregate shall be applied using a double drop bead system, with each drop distributing 50 pounds per gallon (6 kilograms per liter) of black aggregate pavement marking material.

s/b 5 see supplements (errata)

The black aggregate cover-up resin pavement markings shall extend approximately 1 inch (25 millimeters) beyond the edges of the existing markings which are to be covered.

After application, the pavement markings shall be protected from crossing vehicles for a time at least equivalent to the drying time of the material, as specified by the manufacturer.

Initial, In-Service Retro-Reflectivity and Serviceability for Cover-Up Long-Lines: In order to be acceptable, the applied cover-up markings shall meet the following maximum retro-reflectivity and minimum serviceability readings, as measured by the Engineer using a LTL 2000 Retrometer with 30-meter geometry:

1. Initial Retro-reflectivity: shall measure up to a maximum of 20 milli-candelas per square meter per lux, or as otherwise approved by the Engineer, when tested within 14 days of installation.

2. In-service retro-reflectivity: shall measure up to a maximum of 30 milli-candelas per square meter per lux, or as otherwise approved by the Engineer when tested at anytime within one (1) year of installation.

The Contractor shall replace, at its own expense, such amount of cover-up resin pavement markings that fail the initial or in-service retro-reflectivity when, in the opinion of the Engineer, it is no longer effective for the intended use or do not meet the requirements, as specified herein.

Servicibility: shall retain a minimum of 95% linear feet. Determination of percentages of serviceability values will be made anytime within one (1) year by the Contractor's representative and by the Engineer. The decision of the Engineer shall be final. The term "percentage of serviceability" shall be defined as the percentage of the total linear feet for cover-up resin pavement markings measured on the project for payment.

The Contractor shall replace, at its own expense, such amount of markings, if any, required to meet the above stated percentage. The Engineer will indicate the areas and lines to be replaced to meet the above stated percentages.

Replacement under either situation shall include all materials, equipment, labor and work incidental thereto.

Removal of Cover-up Resin Pavement Markings: The cover-up resin pavement markings shall be removed by the Contractor by an appropriate mechanical means that ensures complete removal with minimal pavement scarring, to the satisfaction of the Engineer. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration of pavement markings.

12.16.04—Method of Measurement: Black aggregate cover-up resin pavement markings shall be measured for payment by the actual number of linear feet (meters) of black aggregate cover-up resin pavement markings acceptably installed on and removed from the pavement when it is no longer applicable or when its removal is directed by the Engineer.

12.16.05—Basis of Payment: This work shall be paid for at the contract unit price per linear foot (meter) for "Black Aggregate Cover-up Resin Pavement Markings" of the width specified, acceptably installed on and removed from the pavement. This price shall be for all the work required by this section including the cleaning and preparing of the pavement surface, installation and removal, and all materials, equipment, tools, and labor incidental thereto.

Any black aggregate cover-up resin pavement marking material which is not effective, in the opinion of the Engineer, shall be replaced by the Contractor at no cost to the State.

Pay Item	Pay Unit
6” Black Aggregate Cover-Up Resin Pavement Markings	l.f. (m)
8” Black Aggregate Cover-Up Resin Pavement Markings	l.f. (m)
Black Aggregate Cover-Up Resin Pavement Markings, Symbols and Legends	s.f. (sm)

M.07.25—Black Cover-up Resin Pavement Markings:

Identification: Each container shall have a label affixed to it with the following information thereon: name and address of manufacturer, shipping point, grade production batch number, date of manufacture, grade name and/or identification number, type of material, number of liters, contract number, use intended, directions for application, and formula. Improperly labeled samples and deliveries shall be rejected.

Certification: For each batch of black cover-up resin, a Certified Test Reports conforming to Article 1.06.07 shall be submitted from an independent testing laboratory and approved by the Engineer, prior to installation on the project.

Detailed Requirements:

(a) Cover-up **Resin Material:** The material shall be composed of resins and pigments only.

(b) Composition:

Component	Percent by Weight (Mass)
Carbon Black	7 ± 2
(ASTM D 476 Type III)	
Talc	14 ± 2
Resins	79 ± 4

(c) Black Aggregate: The moisture resistant aggregate shall meet the gradation requirements as follows:

Sieve Size	Percent Retained
#20 (850 µm)	23 - 38
#50 (300 µm)	58 - 74
#270 (53 µm)	1 - 6
Pan	0 - 0.5

The moisture resistant aggregate shall have a urethane coating. The aggregate shall be angular with no dry dispensement pigment allowed.

(d) Adhesion: The black resin pavement marking material shall be formulated so as to adhere to the pavement and existing pavement markings under climatic and traffic conditions normally encountered in the construction work zone.

(e) Abrasion Resistance: When the abrasion resistance of the material is tested according to ASTM D 4060 with a CS-17 wheel under a load of 1000 grams for 1000 cycles, the wear index shall be no greater than 82.

(f) Hardness: The Type D durometer hardness of the material shall not be less than 75 nor more than 90 when tested according to ASTM D 2240 after the material has cured for 72 hours at 73.5° F ± 3.5° F (23° C ± 2° C).

(g) Compressive Strength: The compressive strength of the material, when tested according to ASTM D 695, shall not be less than 12,000 psi (82 740 kilopascals) after 72 hours cured at 73.5° F ± 3.5° F(23° C ± 2° C).

This info should be moved to under Materials

ITEM #1216020A
ITEM #1216021A
ITEM #1216024A